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REVIEW OF THE DEPARTMENT OF THE NAVY'S INVESTIGATION INTO THE GUN TURRET EXPLOSION ABOARD THE U.S.S. "IOWA"

HEARINGS

BEFORE THE

COMMITTEE ON ARMED SERVICES UNITED STATES SENATE

ONE HUNDRED FIRST CONGRESS

FIRST SESSION

NOVEMBER 16; DECEMBER 11, 1989; MAY 25, 1990

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REVIEW OF THE DEPARTMENT OF THE NAVY'S INVESTIGATION INTO THE GUN TURRET EXPLOSION ABOARD THE U.S.S. "IOWA"

THURSDAY, NOVEMBER 16, 1989

U.S. SENATE,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

The committee met, pursuant to notice, at 9:36 a.m., in room SH-216, Hart Senate Office Building, Senator Sam Nunn (chairman) presiding.

Committee members present: Senators Nunn, Exon, Dixon, Glenn, Shelby, Warner, McCain, Wallop, Lott, and Coats.

Other Senators present: Senator Metzenbaum.

Committee staff members present: Arnold L. Punaro, staff director; Richard D. DeBobes, counsel; Marie Fabrizio Dickinson, assistant chief clerk; and Richard E. Caswell, printing and documents clerk.

Professional staff members present: John J. Hamre, William E. Hoehn, Jr., David S. Lyles, Norman G. Mosher, William H. Smith and Frederick F.Y. Pang.

Minority staff members present: Patrick A. Tucker, minority staff director and counsel; Romie L. Brownlee, deputy staff director for the minority; Ronald P. Kelly, George W. Lauffer and Mark B. Robinson, professional staff members.

Staff assistants present: Elizabeth Ann Harlow, Lori M. Jackson, Mary J. Kampo, Kelli J. Pronovost, Melissa A. Ramsey and Debra A. Rice.

Committee members' assistants present: Jeffrey B. Subko, assistant to Senator Exon; Kenneth N. Luongo, assistant to Senator Levin; William J. Lynn, assistant to Senator Kennedy; Charles C. Smith, assistant to Senator Dixon; Milton D. Beach and Donald A. Mitchell, assistants to Senator Glenn; Leon S. Fuerth, assistant to Senator Gore; Terrence M. Lynch, assistant to Senator Shelby; Dale F. Gerry, assistant to Senator Cohen; Dudley L. Carlson, assistant to Senator Wilson; Anthony H. Cordesman, assistant to Senator McCain; Robert M. Soofer, assistant to Senator Gorton; Charles G. Pearcy, assistant to Senator Lott and Eric H. Thoemmes, assistant to Senator Coats.

Chairman NUNN. The committee will come to order.

The committee meets this morning to begin a series of hearings on matters associated with the explosion on April 19, 1989, in the center gun of turret II of U.S.S. *Iowa* which resulted in the death of 47 Navy personnel.

In addition to the Navy's investigation, the committee will be reviewing the operational planning for utilization of the battleships, for manning the battleships and for training the crews.

Before we get into that hearing, though, and that is the main focus this morning; because of the recent accidents that have happened in the Navy, we have asked Adm. Carlyle Trost to come over and we will receive a report from him on the recent spate of accidents and what the Navy is doing during the 48-hour stand down.

We look forward to hearing from Admiral Trost this morning. So he will not have to wait here during the whole investigative hearing on the U.S.S. *Iowa,* we will start by hearing from him.

But first, Senator Metzenbaum is here. Senator Metzenbaum has had a real interest in this, and indeed had written us early and asked for the Armed Services Committee to get into these hearings. I know he has got another hearing. He is not a member of our committee, but would you like to lead off? I know you have to leave, and if you could make it brief, we would hear from you.

STATEMENT OF HON. HOWARD M. METZENBAUM, A U.S. SENATOR FROM THE STATE OF OHIO

Senator METZENBAUM. It will be brief, Mr. Chairman. First, I want to thank you for conducting these hearings. I did indeed write to you and Senator Glenn as well. I think the subject of the hearing is particularly important, and of particular concern to the family of the young man who has been named.

I do have another hearing that I must go to. I expect to return rather shortly, but I did want to express my appreciation to you in the first instance for setting up these hearings and going forward with them and I appreciate your giving me the opportunity to participate with you.

Chairman NUNN. Thank you, Senator Metzenbaum.

Admiral Trost, first of all we thank you for being here on such short notice. We did not give you much time for this and we know that you have many other things that are pushing you. We welcome you here.

Speaking for myself, I applaud the decision the Navy took to conduct this unprecedented review of safety and operational procedures. We are asking you to tell us what you are doing and primarily whether there is any kind of pattern here that indicates serious underlying problems, or whether that is the basic subject of your inquiry.

We really are glad to have you here to hear from you about what the Navy is doing about this series of accidents.

STATEMENT OF ADM. CARLYLE TROST, CHIEF OF NAVAL OPERATIONS

Admiral TROST. Thank you, Mr. Chairman. I do appreciate the opportunity to come before the committee this morning to discuss the very important topic of operational safety.

As you have noted, as a result of the recent series of incidents we have had in our Navy, this past Tuesday I issued a directive to my subordinate commanders that implemented a 48-hour safety stand-down for all units and activities throughout the Navy.

My intention was that each person in a position of authority or command take an in-depth look with his people at our operating procedures that govern how we operate our ships, our airplanes and other equipment around the Navy.

I also directed that they review safety precautions and procedures to ensure that we were, in fact, fully adhering to operating procedures which have been learned as a result of operational experience.

I directed that they leave no stone unturned in trying to determine if there are some things we can or should be doing better in order to prevent accidents.

Finally, I asked that the fleet commanders provide to me their summary of lessons learned, with any suggestions they have, when the standdown is completed, so that I can promulgate them Navy-wide and ensure that we reduce our accident rate to a minimum.

The specifics of that standdown order are really as follows: as I noted it is to standdown. It is to stand down from routine operations. It does not mean bring ships into port for this period, but it does mean that safety-related discussions and reviews take priority over routine operations and administrative functions.

The Navy will continue to operate during this period. Hopefully, we will come out of this standdown much better informed about what we are doing, and we will have some indication of whether or not we are doing something wrong.

Now, this past year has certainly been one of the most publicized in terms of mishaps in our Navy, starting with the tragic explosion on board the U.S.S. *Iowa* in April. In each case, we have conducted exhaustive investigations into the cause, with the intention of precluding the possibility of recurrence. To date, those investigations have revealed no central thread or commonality in the causes. The accidents have been unrelated. Some have been machinery failure, some have been acts of God, others have been errors by our personnel.

As all of us know, operating warships and high performance aircraft in the unpredictable and unforgiving environment of the sea carries a substantially higher level of risk than does most other occupations.

In today's Navy, we have approximately 592,000 men and women, many in their twenties, many younger, manning our ships and flying our airplanes around the globe and around the clock.

Let me give you one example. On the 30th day of September, 219 of our 565 ships were underway, and they were operating. Our aviators on that day flew over 6,200 aircraft sorties from aircraft carriers, from other ships and from land bases.

Now, this was perhaps a slightly more stressful day than normal, but not by much. More stressful, because it was a day that included PAC EX, the Pacific Exercise just concluded.

PAC EX was a large-scale exercise in which our aircraft flew in excess of 32,000 hours without a major mishap. Participating units included almost 100 ships from our Navy and many other foreign navies. They included three aircraft carriers and their embarked air wings, two battleship groups and three amphibious units with their embarked Marine expeditionary units.

I make that comment only to note the magnitude of that operation, which stretched over a total period of 4 months without a significant accident. That is precisely why leadership is so very important and why our Navy has very strict procedural guidelines and thorough training programs for our personnel, and why we place strong emphasis on supervisor and officer oversight. Our Navy people are unquestionably our most precious asset. We are committed to do what is required to reduce that level of risk to them as much as possible.

Despite the most recent accidents, which prompted me to take this unprecedented action of a Navy-wide safety standdown, I think it is important to note that the overall safety record of our Navy has been steadily improving throughout the decade of the 1980s. Operations and training-related major accidents have declined in each of the past 5 years.

In 1984 the Navy had 118 major accidents. To date this year, that figure is 67. Operational-related deaths for 1989, if we were to exclude the tragedy on the *Iowa,* are also the lowest in the last 5 years.

Our aviation wings and squadrons have set new safety records in the past 2 years. This is computed on the number of mishaps per 100,000 flight hours. In 1989, that figure was 1.8; that is 1.8 mishaps per 100,000 flight hours. Let me try to put that in perspective. 1989 was three times better than 1980, and 33 times better than when I was a junior officer in this Navy.

Some other specifics: the carrier *Ranger* just returned from a 6-month deployment, mishap-free. Five of the last seven carriers that returned from deployment in the Pacific came home after operating 6 months each without a Class A mishap. That means no fatalities and no aircraft damage of greater than one-half million dollars in cost. Our Atlantic Patrol Wings, comprising all the maritime patrol aircraft on the east coast, recently passed the 1-million hour mishap-free flight safety mark.

In the case of the *Lexington,* a highly-publicized and regrettable accident that resulted in the loss of a pilot and four others just recently, it is important to note that, prior to this incident, the *Lexington* had operated for 16 years without a fatality. On balance, her safety record has been exemplary.

Each accident, each injury, each loss of life is extremely troubling, not only to me but indeed to everyone in a leadership position in our Navy, and of course, each one of us always asks ourselves the question, why?

I have to note, however, that I continue to have the utmost confidence in the officers commanding our ships and flying our aircraft. I am equally confident in the talent and superior ability of our men and women to operate their equipment in the safest manner possible, and I want to assure this committee and the men and women in our Navy and their families that we are committed to operational safety at sea and ashore.

Thank you, sir.

Chairman NUNN. Thank you, Admiral Trost.

Just two or three questions. You said there is no common thread that you have yet discerned running through these series of accidents?

Admiral **Trost**. That is correct. We have looked at every one of them, and some as I noted are due to personnel error—as a matter of fact, the majority are—and some to equipment failure and some are totally unexplainable. There will be mishaps, as we well know. Our goal is to minimize the numbers.

Chairman **Nunn**. As the Chief of Naval Operations, when you start seeing this kind of pattern in mishaps and you take the almost unprecedented step, which I think was warranted here, of standing down for 48 hours, for the entire Navy, what kind of common threads would you be looking for? What are the questions that you as CNO are basically posing to the fleet?

Admiral **Trost**. The questions I posed are the following: Are we knowledgeable of and adhering to established operating procedures throughout the Navy? Are we knowledgeable of and adhering to established safety precautions throughout the Navy? Do we become complacent at the end of an exercise and say, okay, the hard stuff is over, this is a piece of cake? Are we really conscious of everything going on around us that leads to safe operations?

Chairman **Nunn**. The questions come to mind as to whether you are operating at too high a tempo, or are you putting too much stress on the ships or the men on them? Have you asked that question?

Admiral **Trost**. We did. We asked ourselves that earlier this month, at the beginning of this month, as a matter of fact, when I gathered all of my senior commanders over in Annapolis to discuss this and other Navy operational matters.

We satisfied ourselves that the constraints we placed on operational tempo back in 1985 are indeed being adhered to with very few exceptions, and that we are not running our people into the ground.

We looked at some of the major exercises we have conducted where the tempo of operations is much higher than in routine training exercises. Again, we were satisfied that procedures were being followed, including safety procedures, as evidenced by the fact that there were no mishaps in these intensive exercises.

That might lead one to conclude that perhaps people are more safety conscious when the operational tempo increases. We must then ensure that complacency does not set in after the exercise.

Chairman **Nunn**. What about the shore time, compared to the time at sea? Is that any higher than it has been in recent years? Is there any pattern there?

Admiral **Trost**. It has remained about the same over the last 4 years. We have had very fine support from Secretary Cheney in ensuring that commitments do not drive our people into a position of being over-extended and overly tired.

This support has been extremely helpful to us in that, as demands on the Navy have continued, we have nonetheless been able to protect our people from excessive personnel time away from home port and excessive op tempo.

Chairman **Nunn**. What about the quality of the personnel coming into the Navy and the quality being retained? Have you seen any notable difference in that?

Admiral **Trost**. No. As a matter of fact, we have been rather pleased with our ability overall to both access and retain people of the quality we need in today's Navy. This year's experience has shown that we are in fact getting a slightly higher quality of recruit as measured by mental category and high school degree completion.

We also have seen an increase in retention this year, which my fleet commanders attribute largely to the fact that we are in the second year of properly funding our military personnel accounts. So we are taking care of our people, and they know it. We are promoting them when due, we are transferring them on schedule, and they are generally satisfied and staying with us.

Chairman NUNN. I understand the Navy has instituted a new policy for attempting to retain rather than discharge marginal performers and personnel with minor disciplinary problems and has directed commanding officers to attempt to motivate such personnel through increased attention to leadership. I do not know the exact beginning date. My impression is the last few months, this year sometime. I understand this is a new policy, and it has to do with some recruiting difficulties and some first term retention difficulties. Could you comment on that, particularly whether there is any relationship here between what some would say is a little loosening of the standards and the accidents we have seen?

Admiral TROST. I would be glad to comment on that since I was directly responsible for that change. It was motivated not by recruiting difficulty but by the desire to do the job with less money. If we recruit fewer people, we do not spend as much money.

I looked at our retention picture and noted with concern that about one-third of our people did not make it through the initial 4-year-period, from the time of entry into the Navy until reaching the first expiration of enlistment point and we started asking, "Why?" We found a number of reasons. We found that we were losing a large number of people in basic recruit training, where, for example, you have so much time to learn to swim or else. Well, some people may not have been exposed to swimming pools before, so it takes them a little longer to get acclimated. So we did, in fact, relax our standards in terms of the time it took for an individual to qualify to swim.

We found that some people who have never worn anything but sneakers have trouble when they put on boondockers and other kinds of heavy Navy shoes and they get blisters on their feet, and then we throw them out as physically disqualified. That strikes me as stupid.

We found in many of our training schools that instead of taking someone who had difficulty with one aspect of the course and letting him repeat that part of the course, we were simply saying, "you did not make it; you are out." We were losing a lot of potentially good, capable, talented people.

We also found that through lack of necessary supervision and leadership, many young people coming aboard ship were drifting off after being well indoctrinated during their recruit training or their basic schooling. Left on their own, they drifted into trouble. Eventually, we said, "you are a problem, out you go." That is abrogating the leadership responsibilities of command, and I have asked that that be turned around.

We have, in the few short months since that policy has been in effect, had a quite noticeable positive improvement in our retention of good people. We are not interested in keeping people who are not.

Chairman **Nunn**. Admiral, I am going to defer in just one moment. My time has expired for questions. I will wait until we are done with the questions, and then I will get you to introduce the people who have conducted the investigation on the *Iowa*. Senator Warner.

Senator **Warner**. Thank you, Mr. Chairman. Admiral, we welcome you here this morning.

You said that you have the utmost confidence in your officers and men. I want you to know that America has the utmost confidence in you as the senior sailor. You have been an outstanding Naval Officer since the day you entered the U.S. Naval Academy and graduated at the top of your class. If fate dictates that the Navy must for some unexplainable reason experience this incredible number of serious accidents, then we are fortunate to have such a fine sailor as you at the helm.

Admiral **Trost**. Thank you, Senator.

Senator **Warner**. Now, we support your action. I join the chairman in supporting the standdown of the Navy. I think it is the first time in the history of the U.S. Navy that this has been done on a fleet-wide basis. Am I not correct?

Admiral **Trost**. I think you are. We have done it unit-wide many times, but I do not believe it has ever been done fleet-wide.

Senator **Warner**. I think that action was prudent for many reasons, but foremost because it is a signal from you to all the families that the welfare and safety of the men and women who serve in uniform is your first priority; and you also recognize that those families bear an equal measure of the risk, of the mystique and the mystery, of that sea service which your sailors endure every day.

Now we are about to get into the hearing. I think the chairman covered as much as we can on the series of accidents. This morning we are about to start our own overview. It is not an investigation; it is an overview of the work done by the Navy in connection with the tragedy aboard the U.S.S. *Iowa*.

I am concerned that there have been some allegations of coverup by the U.S. Navy, and I would like to ask you whether in investigating not only the *Iowa* but every one of these instances, have you found a single incident involving any officer or any man trying to cover up the facts?

Admiral **Trost**. Senator, I have not found that, and we would not tolerate that. Our goal in investigating accidents is to determine the cause and make sure we do not repeat errors so we can protect our people.

Senator **Warner**. I thank you, Admiral.

I hope that we do not, during the course of this hearing, Mr. Chairman, observe anyone coming in here and alleging a coverup unless that person can show us the facts to support such an allegation.

Chairman **Nunn**. I had not seen those charges, Senator Warner, but I am glad you asked the question.

We certainly are going to be getting into this very thoroughly, but I think you termed it correctly. This is not an investigation as such. We are really giving oversight to determine whether the Navy has done its job. We will be hearing from the General Accounting Office. We will be getting other outside people's opinions, but we are not doing our own complete, total investigation. Senator Exon.

Senator WARNER. May I ask one further question, Mr. Chairman?

The President and the Secretary of Defense have had to accept the reduced funding levels as provided by the Congress for the Department of Defense for a number of fiscal years now, five consecutive reductions. I am certain that you would not send a ship to sea, or men or women, as the case may be, into aircraft, should there be insufficient funding to make that ship safe or that aircraft safe.

In other words, in your judgment, has the retrenchment of the funding for 5 consecutive years impacted in any such way as to be a cause for any of these accidents?

Admiral TROST. It has not, in my judgment, impacted readiness or caused any accidents. In the face of a declining budget over the past 5 years, we have continued to emphasize safety and operational readiness of the units that have to go out there on the front line.

The cuts we have taken have been in our ability to sustain those forces over extended periods of time, and in procurement and force modernization.

Senator WARNER. I thank you.

Chairman NUNN. Thank you, Senator Warner. Senator Exon.

Senator EXON. Mr. Chairman, thank you very much.

Admiral, welcome. Thank you for being here this morning. Let me just second the general remarks that have been made by the chairman and the ranking member. I salute you for your distinguished career.

I especially thank you for taking the courage to have the safety standdown that you have announced. I think that is a step in the right direction. I do not know what that is going to show, but I suspect that because of the high quality of our leadership in the Navy and our Navy as a whole and the equipment that you operate, we are probably going to come to the eventual conclusion that as a group these are things that happened. There are lots of times when strange phenomena take place.

I cite the example that we have had frequently in history where we have had three consecutive disasters with regard to commercial aircraft, and no one knows the explanation for this. You were very forthright in taking the standdown, and we will be looking forward to the reports that you are, I am sure, going to give us in that regard.

In preface to my questions, I also wish to say that I think there has been no member of this committee that has been as stalwart a supporter of the U.S. Navy and all the U.S. Navy has done and will do in the future for our overall national security as this Senator. Certainly, I have been at the forefront of many of the things that are critically important to our national security that you, as the head of the U.S. Navy, and others have been involved in and a whole series of matters that I will not try to enunciate this morning.

I do, though, want to go into something that I think we could only ask you about this morning. I first wanted to know whether or not you have had a chance to read the story in a leading newspaper this morning that indicated that there at least were some preliminary discussions within the Navy to retire the battleships in their entirety. What degree of truth is there to that, and what do you know about it?

Admiral TROST. Well, they did not talk to me before they wrote it. Let me give you my personal view.

We would have no basis whatsoever for retiring the battleships as the consequence of the accident back in April of this year.

Senator EXON. Let me interrupt you right there. I am not talking about the actions of last year. I am talking about overall strategy.

Admiral TROST. Overall strategy, Senator, is a difficult one for us right now because we are awaiting the final appropriations bill for this fiscal year, and we are engaged in the Pentagon at the present time in determining those actions necessary to structure the 1991 budget to meet the country's concerns about deficit and the need for a declining defense establishment.

As we look at the need to shrink the Navy, I cannot give you a precise answer today as to what its complexion will be. I will tell you that, yes, everything is up for grabs today as we face a smaller out year budget projection.

Having said that, our goal for the future is to maintain the maximum combat readiness in the Navy, even if it shrinks somewhat smaller.

The battleships have been a major contributor to our power projection capabilities; they are a factor in many scenarios around the world. We would have to look very hard before we would decommission any of them. That does not say they are guaranteed to stay in. They will take their shot with everyone else.

Senator EXON. I guess you know that I was one of those who led the unsuccessful battle against the battleship reactivation program. I also led the unsuccessful battle against the home porting issue.

I guess that whether or not my determination at that time was right or wrong, I would suggest to you that you would be wise, indeed, to make the in-depth studies that you just mentioned.

I have been extremely disappointed to note that the President of the United States of all people has said that he could "live with" the sequester cuts as far as our national security is concerned. I think this is an ill advised decision by the President of the United States, but that is one he has made.

I would certainly say that if the sequester would come into being and with previous testimony that we have from Admiral Edney that Navy shore establishments had already suffered tremendous cuts, I suggest that if we have to make substantial cuts in manpower that this is undoubtedly going to have to go into shipboard manpower.

If this is necessary, would it not seem to be wise to at least consider mothballing some or all of the battleships? It seems to me that the cost of maintaining battleships with their large crews is something that we should look at very carefully if we have to make some sacrifices in manpower.

Would you generally agree with that statement?

Admiral TROST. We are going to have to make some sacrifices, without question.

The dilemma I face with the cuts that sequestration poses is really as follows. To decommission ships in a year when they are not programmed means there is no money there to lay them up, so it actually costs us more from a standpoint of the mechanics of decommissioning the ship than it does to continue to operate it.

In addition, the people who man the ship do not disappear, so we continue to pay them. What we would do to reduce numbers, of course, is involuntary reductions in force to the extent the law permits—which is not very much—and reduction in recruit accessions during that year which saves you much less money per man, of course, than it costs to train the skilled people we already have here.

So it is quite a balancing act for us when we face such a sequestration threat, especially when we will not know the exact amount, if any, until well into the fiscal year in which we have to take the action.

Senator EXON. Admiral, thank you. We will get into the battleship *Iowa* matter with the other people who follow. I thank you for being here, and thank you for the response to my questions.

Thank you, Mr. Chairman.

Chairman NUNN. Thank you, Senator Exon.

As I announced earlier, for members who have come in a little late, the main purpose of the hearing this morning is to hear from those who are responsible directly for the investigation of the explosion of the U.S.S. *Iowa*. We asked Admiral Trost to come up and give us his explanation of the 48-hour standdown and what he is doing. So that is where we are now.

I do not want to cut anyone off on questions, but we do want to let Admiral Trost go as soon as possible. Senator Wallop.

Senator WALLOP. Mr. Chairman, I want to do the same thing and just as well add a tip of my hat to Admiral Trost for what he has done and what he is doing.

Chairman NUNN. Thank you. I believe Senator Glenn was next.

Senator GLENN. Yes, just a couple of comments. Admiral Trost, your figures on aircraft accidents are very interesting. I am getting old enough to say this. I recall back in the old days that those figures you gave used to be applicable to 10,000 hours of flight time approximately in the same ball park, 1.82, 2.2. It went up and down from year to year, but they were on 10,000 hours. Now those figures are on 100,000 hours flying time.

Admiral TROST. That is correct.

Senator GLENN. Just to indicate what has happened in the meantime. I know we have to get on to the *Iowa*, but there is something here I wanted to ask about the *Iowa*. One of the investigating teams' reports cites lack of proper supervision of weapons personnel, poor adherence to explosive safety regulations, and a lack of effective weapons training. They went on to say only 13 of the 51 personnel in turret II were fully qualified under the PQS, Personnel Qualifications Standards, for their watch station. Neither the commanding officer, executive officer, weapons officer nor the gunnery officer knew of the large number of watch stations being manned by personnel not fully qualified under the PQS program.

Now when that kind of a pattern was aboard one of our capital ships, the question I would like to ask is have you looked at the other ships in the Navy to make sure that that pattern is not followed?

I think that was one of the problems that came out of the *Iowa*, and we will be getting into more details of that later today. That is an appalling, appalling situation aboard a capital ship of the U.S. Navy.

The second question is, with the current rash of problems, are the O&M funds or lack thereof a problem?

Before you answer those two questions, let me just comment on the battleships which Senator Exon commented on. I think we need to remember the battleships were brought out not just to get some 16-inch guns out there, but we were looking for missile platforms, something that was tough and survivable that would take the Harpoon and the Tomahawk and be survivable in a combat situation.

That, as I recall, was the prime reason we brought them out. We got the 16-inch guns for free because it turned out that those battleships were the best possible stable platform for what we wanted to do with missiles. So I think that requirement is still there. I think too many people just equate the battleship with the 16-inch guns, and that is not the case.

Would you comment, please, on what was found out of the *Iowa* and also other parts of the Navy, and were O&M funds a factor?

Chairman NUNN. Let me say this, Admiral. Answer the question as you will, but I would not want to get the Admiral in front of the investigating people on the detailed questions about the *Iowa*. That is what I wanted to make clear.

Senator GLENN. I agree with that.

Chairman NUNN. That would turn the hearing upside down, and I hope that it will be answered in general terms. We can call Admiral Trost back. He said he would come back on any questions like that. But first and foremost, I would like to hear from the investigative team.

And with that in mind, Admiral, go ahead.

Admiral TROST. If I may, Senator Nunn, I would like to answer Senator Glenn in a very general way.

Senator Glenn, and I know that Admiral Milligan can discuss his findings in great detail. I can discuss in more general terms what we did about those findings immediately after they were submitted, and well before the investigation was reported out under my signature.

We immediately went out to our type commanders and conducted safety standdowns on all our battleships, thoroughly investigating safety conditions on each of them. *Iowa* completed its standdown with all deficiencies fully corrected prior to her departure for the Mediterranean deployment from which she will return probably sometime next month.

Many of the deficiencies were, I understand, administrative, a question of documentation, but I will defer to Admiral Milligan on the specifics.

Let me turn to O&M. The operation and maintenance funding has been maintained at as high a level as we can put in with the top line we get because we have, in fact, preferentially funded our readiness accounts. To date, I cannot tie reductions in operations or maintenance accounts to a lack of adequate spare parts or a lack of adequate maintenance.

That is, however, a concern of mine for the future.

Senator GLENN. But the PQS problem, is that something that is evident throughout the Navy? Are we operating carriers and destroyers and the other ships with as low a percentage of PQS qualified people in all the different functions aboard ship? That was the basic question I was asking.

Admiral TROST. The PQS qualification documentation does apply to every ship in the Navy, and the focus of your question has also been directed to the fleet commanders. I have gotten no indication in the last 6 months that we have a problem Navy-wide in the area of PQS qualification.

Senator GLENN. Do we have an overall Navy figure for what percentage of jobs are filled by key PQS people? That is the bottom line.

Admiral TROST. We do have. I cannot give you that off the top of the head, but every ship has that, yes.

Senator GLENN. Thank you, Mr. Chairman.

Chairman NUNN. Thank you, Senator Glenn. Senator Lott.

Senator LOTT. I will pass, Mr. Chairman.

Chairman NUNN. Senator Dixon.

Senator DIXON. Well, Mr. Chairman, I have been here since before the committee hearing began and, frankly, I differ with some of my colleagues. I am critical of the investigative report, but I hear what the chairman says, and I think the chairman wants to get along to the question of what happened on the *Iowa*, and I would be delighted to make my statement which is somewhat critical, frankly, after Admiral Trost has been excused.

Chairman NUNN. We will have opening statements on the *Iowa* after Admiral Trost departs. Thank you, Senator Dixon. Senator McCain.

Senator MCCAIN. Thank you, Mr. Chairman.

Admiral, thank you for your very strong stand, and the decisive action that has been taken in light of these very serious incidents and accidents that have taken place over a relatively short period of time.

I think it is well to point out that every operating unit in the Navy undergoes a safety standdown at one time or another during the year. This is, of course, to refocus everyone's attention on a prime concern in peacetime, and that is safety. Perhaps a Navy-wide standdown is unusual, but a safety standdown per se is standard operating procedure throughout the Navy, is that not correct?

Admiral TROST. That is absolutely correct. We normally have a safety standdown after any incident or any mishap. It is an especially widely followed practice in our aviation community, and it is not unusual to do that for a single unit or activity.

Senator McCAIN. With regard to the requirements for battleships, do you not think it is more appropriate to address that in the overall scheme of whatever force reductions we are required to make as opposed to a reaction to an accident that took place on one battleship?

Admiral TROST. I would agree. We will be addressing that as part of our overall proposed force structure once fiscal guidance is promulgated. That is why I stress that no (force structure) action on battleships will be taken as a consequence of that accident. There is no basis for that sort of action on the basis of that accident.

Senator McCAIN. I would like to emphasize again that I think it would be sheer foolishness for us to base whether we should maintain the present level of battleships or any battleships in our naval operating forces on the basis of the fact that an accident took place. If we did that, I would say that the carriers would be out of business fairly soon since unfortunately we have not been able to reduce carrier aviation down to a zero accident rate.

I would like to ask one generic question. All of us are keenly aware of the fact that there are going to be significant cuts in defense spending. That is clearly what is going to take place, and I think that some of the decisions that are going to have to be made are going to be very painful.

One of the decisions that is going to have to be made or one of the recommendations that will have to be made by you is whether there will be further cuts in O&M which you said is a matter of great concern to you or whether we are going to have to cut force structure. What would be your recommendation in that case, Admiral?

Admiral TROST. Well, Senator, my personal view is that, given a lesser fiscal top line, our goal should be to reduce our force structure and maintain the readiness of what remains. That means keeping the forces that we have left ready to operate as they do today, and that includes properly manning those forces.

Senator McCAIN. Thank you. Thank you very much, Mr. Chairman.

Chairman NUNN. Thank you, Senator McCain. Senator Coats.

Senator COATS. Mr. Chairman, I am going to pass at this point. I know there is a presentation to be made, and I am anxious to see that.

Chairman NUNN. Admiral, let me just say that I have made no conclusion at all about what we ought to do with the battleships. I supported two of them and opposed two of them, but that is a matter of history and not a matter of what we ought to do now.

I do not think we ought to make our decision based on one incident. I do think that there is an intense call for very large numbers of personnel in a period of time where the budget is coming down. They have to be reviewed, as you said, like all the other ships. In fact, they have so many personnel on them, and they are intensive and so forth. We have to look at the question of whether some of the fire power is, indeed, needed, and what the mission of the ships are in the modern Navy. We are going to be looking at all those questions in this.

I have not come to conclusions, so we will make that absolutely clear. Any reference or any story that I have come to a conclusion is erroneous. I want to make that clear.

Would you please, Admiral Trost, before we get to the panel of witnesses, tell us what you did when the *Iowa* accident occurred and from that point on what has been done by the investigative team. In other words, would you introduce this panel to us, and then, because we know you have other business, we will excuse you.

Admiral Trost. All right, sir. I would be pleased to.

Immediately after we received word of the accident, Vice Adm. Joe Donnell, who is Commander of Naval Surface Force, Atlantic, directed Rear Adm. Richard Milligan, who was then Commander, Cruiser-Destroyer Group 2, to immediately convene an investigating board and look into the cause of the accident, determine its cause and corrective action necessary to preclude its recurrence.

Admiral Milligan was especially well suited to that task since he had commanded four ships, including the battleship *New Jersey* for a period of 2 years. He was, therefore, well-suited and knowledgeable of battleship operations as well as extremely experienced in operations at sea. He was the senior investigating officer.

He has, at various times, called in for his assistance, numerous technical experts; and members of the Naval Investigative Service, when he was advised that there was a possibility of criminal action attendant to this particular accident.

He is accompanied this morning by two of those technical experts; Capt. Joseph Miceli, from our Naval Sea Systems Command, is one of our foremost ordnance experts and responsible for the very large number of tests that were run to help ascertain the cause of the explosion.

He is also accompanied by Mr. Bob Powers of the Naval Investigative Service, who will represent NIS and their part in the investigation.

Chairman Nunn. Thank you very much, Admiral Trost. We appreciate your being with us and, again, during the course of this series of hearings on the *Iowa* explosion, we may need to get you back. But at this point in time, we will thank you for your testimony and hear from the other panel. Thank you, sir.

Admiral Trost. Thank you, Mr. Chairman.

OPENING STATEMENT OF SENATOR SAM NUNN, CHAIRMAN

Chairman Nunn. I will be making a brief opening statement, and I will open it for other opening statements since people have deferred.

Our witnesses on the *Iowa* oversight hearing will be Rear Adm. Richard D. Milligan, U.S. Navy, the Investigating Officer; Capt. Joseph D. Miceli, U.S. Navy, the Director of the Technical Support Team that was responsible for the various technical testing that sought to identify the cause of the explosion; and Mr. Robert J. Powers, the Director of Criminal Investigations of the Naval Investigative Service, which conducted the criminal investigation into the explosion.

I know the tremendous amount of effort and time Admiral Milligan and his team spent on this investigation, and we appreciate your accommodating our schedule. We express to you our thanks for all of your hard work, you and your entire team.

At the outset on behalf of every member of the committee, I want to express our deepest sympathy to the families and loved ones of the members of the crew of the U.S.S. *Iowa* who died in this tragic incident. I also want to express our gratitude to the men and women of the armed services—the Navy and the other services—who perform their everyday duties under dangerous circumstances to preserve the security of our Nation.

The primary purpose of this series of hearings is to determine if the dangers implicit in the operation of this class of warship and others in the fleet have been reduced to the absolute minimum, and to ensure that the Navy has done all that it can do to achieve that result.

The Navy's investigation did disclose a number of discrepancies in the weapons department on board the U.S.S. *Iowa*. Those discrepancies include: the use of a prohibited mixture of explosive charge and projectile; the use of an unauthorized round configuration and plans that made the ship essentially a floating research and development platform; improper pre-fire briefs; lack of compliance with personnel qualification standards referred to as PQSs in that in turret I only 4 of 55 personnel were PQS qualified, in turret II only 13 of 51 were qualified, and in turret III only 9 of 62 were qualified; improper storage of powder in barges; poor adherence to explosive safety regulations and ordnance safety.

Despite these discrepancies, Rear Admiral Milligan opined that they did not contribute to the explosion and that the explosion resulted from a wrongful intentional act and that the wrongful intentional act was most probably caused by GMG2 Clayton Hartwig. This conclusion and others have been challenged, and I know that Admiral Milligan will address those challenges as will the committee during our review.

It is also noteworthy that during the course of the investigation, information was received primarily through the testimony of Captain Moosally, the commanding officer of the U.S.S. *Iowa*, and we will be hearing from him sometime in December, which raised questions concerning, number one, the priority of officer and enlisted manning and the quality of personnel on board the U.S.S. *Iowa* and her sister battleships; number two, the adequacy of training on the 16-inch guns since there is a lack of hands-on training for personnel prior to reporting to the battleships; number three, the employment plan for battleships, and this goes to the overall strategy in the Navy and the Navy deployment; number four, the responsiveness of the Navy to repair requests from the battleship; and number five, the adequacy of various inspections and surveys conducted on board battleships.

Rear Admiral Milligan was not charged to and did not inquire into these matters, as I understand it. I have, therefore, requested the General Accounting Office to look into these matters as well as to review the Navy's investigation as a whole in an attempt to assess its adequacy and to validate its conclusions, particularly those relating to the safety of the ship.

I would ask unanimous consent to insert my letter to the GAO in the record.

[The letter referred to follows:]

U.S. SENATE,
COMMITTEE ON ARMED SERVICES,
Washington, DC, October 3, 1989.

Mr. CHARLES A. BOWSHER,
Comptroller General, General Accounting Office, Washington, DC.

DEAR MR. BOWSHER: As you may be aware, the Senate Armed Services Committee is presently reviewing the Report of Investigation into the explosion on U.S.S. *Iowa* on April 19, 1989. We are planning to hold hearings as soon as possible after we complete conference with the House on the Department of Defense Authorization bill.

My staff has held preliminary discussions of an exploratory nature with personnel of your office to alert them to a need for your assistance in reviewing the voluminous report in an attempt to assess the adequacy of the investigative effort and to validate the conclusions of the investigation, particularly those relating to the safety of U.S.S. *Iowa* and its gun turrets. One purpose of this letter is to reaffirm that request for assistance. I realize that this is a major undertaking and thus may be quite time consuming. I would ask, therefore, that I receive interim reports on a monthly basis summarizing the actions that have been accomplished and such conclusions that may be reached, even on an interim basis, as to the safety of the ship.

I am also concerned with certain issues which arose during the Navy's investigation, but which were not pursued since they were not considered to be immediately relevant to the specific task at hand, i.e. the cause of the explosion, once equipment malfunction and accident had been ruled out. Accordingly, I request that GAO inquire into these other "beyond scope" issues both with respect to U.S.S. *Iowa* and her sister battleships, such as the priority of officer and enlisted manning; adequacy of training on the 16-inch guns; responsiveness of the Navy to CASREPs and repair parts requests; adequacy of various inspections and surveys conducted on board; authorization for utilization of the ship for experimental purposes; and the "employment plan" for battleships. Once again, I realize that this effort may take some time and I would like to have monthly reports on these issues as well.

I appreciate your assistance in this important matter. The point of contact on my staff will be Rick DeBobes, who may be reached at 224-7530.

Sincerely,

SAM NUNN, *Chairman.*

Chairman NUNN. This morning, we want to provide an opportunity for the three witnesses from the Navy to explain their efforts to identify the cause of the explosion and to evaluate the safety of the U.S.S. *Iowa* and her sister battleships.

In the future we will have additional hearings at which we will receive testimony from other members of the Navy from Captain Moosally, Commanding Officer, U.S.S. *Iowa,* the FBI and the General Accounting Office. We will call other witnesses if appropriate.

We hope in the course of these hearings to explore fully all of the issues I have detailed previously and, in particular, to satisfy ourselves as to the safety and utility of this class of ship for continued fleet operation.

Before hearing from our witnesses, I will give Senator Warner and other members who have an opening statement a chance to be heard, beginning with Senator Warner.

Senator WARNER. Thank you, Mr. Chairman. I think the record will reflect that it was the Senator from Virginia who first asked for this hearing.

Chairman NUNN. I believe that is correct.

Senator WARNER. I did so, because of my love for the Navy and the families that have served it in the past and present and will in the future.

And, as we conduct this hearing this morning, I hope we will act with compassion for the men who died in the explosion and for their families and their friends. Their loss is still felt, their grief is still with us. And the memory is, indeed, painful for all of us.

We should also remember that the Navy is more than just a large, faceless organization. It is a living body of individual men and women skilled and well-meaning, who are trying with their very best talents and ability to serve their country and to do the right thing.

Second, we want to be fair. We must let the men and women who serve in the Navy know that, if they were involved in a similar situation, that they would receive fair treatment, when their situation is examined by the Congress.

Our sailors serve in many faraway places, often in situations of personal risk and danger. As the Admiral and CNO just said, there are 565 ships in the Navy and over 6,000 aircraft. Safe operations must be emphasized at all times.

But the sea will always remain a mystical, dangerous environment. When something goes wrong, when tragedy occurs, then men and women in the service will demand that we, the Navy and the Congress, will treat them with fairness. They will expect our deliberations to be just that and no more.

Third, we must remember that there were no survivors from the direct area where this event occurred. Much of the evidence was destroyed, as a consequence of this accident. And, therefore, the Navy is faced with examining some direct evidence and a very considerable amount of circumstantial evidence.

And there is no other recourse, but to base your conclusions on a mix of direct and circumstantial evidence. While we might wish there were additional or better direct evidence from which stronger conclusions could be reached with a higher degree of certainty, we cannot dismiss the fact that you have done your very best, given the unusual circumstances of the evidence in this case.

So, we hope that as we hear the witnesses and question them today, we will remember the difficult circumstances under which this investigation had to be conducted.

Individually, we may not be satisfied with particular findings or conclusions reached by the Navy. But that does not necessarily mean these findings or conclusions are in error.

If we find, as a committee, the Navy's investigation is lacking in some respect, we should demand that that deficiency be corrected. And the Navy is best qualified to make that correction.

But we cannot merely sit back and announce that we disagree with a particular finding or conclusion of this report, unless we are prepared to reach some different finding and conclusion based on available evidence.

In summary, Mr. Chairman, I hope the committee will choose to conduct these hearings as if it were an appellate review body.

We should ask if all available evidence has been obtained, considered, and if the Navy could properly reach its findings and conclusions based on that evidence.

I join you, Mr. Chairman, in welcoming our witnesses here today. Thank you.

Chairman NUNN. Thank you, Senator Warner. Does anyone else have an opening statement? Senator Exon.

Senator EXON. Mr. Chairman, just a comment or two.

I thank you for coming here this morning, gentlemen. This is a very, very serious matter. I guess that many of the questions that I have will not be answered with this hearing today. There may be other hearings that are going to have to go on into other areas.

Most of the information that I have on this matter comes from press reports and press releases. Some of them are official statements from the Navy, and some of them are not, obviously.

So, I am not making judgment on that kind of a basis. However, this is the beginning of a process that, I think, we have an obligation to fulfill as members of the Armed Services Committee. We certainly wanted to be fair and open with you this morning, and appreciate the testimony that you are about to give.

What concerns me most about all of this thus far, is that there have been changes in several stories from official and unofficial positions. There have been accusations made about people who no longer can defend themselves.

Some of the accusations, I believe, the Navy has proven wrong with later follow-up testimony. The evidence against Petty Officer Hartwig is highly circumstantial. And when you are into a highly circumstantial situation, we are treading on terribly difficult grounds.

I congratulate the chairman for calling this meeting. And I am glad that you are here. And we will be listening and answering questions with great interest.

Thank you very much.

Chairman NUNN. Thank you, Senator Exon. Senator Wallop.

Senator WALLOP. Mr. Chairman, let me again welcome the Navy officials here. And also let me echo the call for fairness. I guess from somebody from Wyoming's point of view, the best way to be fair is not to prejudge the Navy's behavior, their investigations, or their conclusions before hearing and examining them, and before exploring their conclusions compared to those of others.

I do not think we are in any position to make that judgment at this moment in time. I expect the Navy to be fair and competent, and I am sure they will show themselves to have been that way.

Chairman NUNN. Thank you, Senator Wallop. Senator Dixon.

Senator DIXON. Mr. Chairman, there is a very disturbing headline on the front page of the State Journal Register today, the major newspaper in Springfield, the capital city of my State of Illinois. It says, and I quote, "FBI reportedly told to ignore possibility of accident in *Iowa* blast."

Springfield has been a second home to me for many years in my public service. And so I can readily relate to the concern of Springfield citizens, as they look at this headline and wonder just what in the world is going on, and what really happened.

Today we are going to hear from Rear Adm. Richard Milligan, who directed the investigation of the tragedy on the battleship *Iowa*.

This investigation was designed to tell us what caused the explosion that took 47 young lives. Unfortunately, Mr. Chairman, in my view, the report raises more questions than it answers. The report is the culmination of a series of leaks that reflects poorly on the professionalism of the Naval Investigative Services. And, incidentally, Mr. Chairman, I am informed that the Inspector General's investigation culminated in a report on file with us, that I have not yet seen, I must confess, that comments on these leaks by the Navy.

It is a report that seems based on supposition and guesswork—that is, the naval report—rather than fact and physical evidence. It is, in short, in my view a report that seems to be unraveling.

Today's Journal Register headline did not uncover an isolated flaw in an otherwise admirably conducted investigation. In my view, it is one of an ever growing series of stories that raise fundamental questions about the quality of the investigation, and which destroys our ability to believe its conclusions.

Mr. Chairman, I think we owe the American people much more than that. I think we owe the Hartwig family and the families of all the men who were killed, more than that. I think we owe the Truitt family more than that. And finally, I think, we owe the Navy more than that. I do not think we can afford to have this investigation stand as the truth of what happened.

I think we need to create an investigative subcommittee, possibly, staffed with the resources necessary to do the job right. I think this subcommittee should have two main tasks, at least. First, and most importantly, it ought to find out why the 16-inch gun exploded, if that can be determined. And, second, it ought to review the investigation the Navy conducted and tell us what was done wrong, if anything, and recommend how we can handle future investigations of the kind that we are reviewing this morning.

The subcommittee ought to have the help of the Federal Bureau of Investigation, both to review the physical evidence, and to consider all of the evidence, so we can determine whether the explosion was a result of a terrible accident, or whether it really was the result of deliberate actions.

I think it must be done, Mr. Chairman. It should be started, in my view, just as quickly as possible. And I think really too much time has passed already.

In conclusion, I have expressed before to the Chair and other members of this committee my concern about a variety of accidents, principally the *Iowa,* but others as well. I believe, as the U.S. Senate Committee authorized by jurisdiction to look into these matters, we ought not to let these decisions be made internally by the affected branch of the service that is looking at it. That is my concern here.

Chairman NUNN. Thank you, Senator Dixon.

I do not know whether you heard my opening statement or not. Several weeks ago, we asked the General Accounting Office to do a thorough review of the Navy's review to determine whether they did conduct an objective analysis.

The GAO has literally hundreds of people. I believe they have qualified people. If you really are suggesting we have a subcommittee, and hire expertise in that subcommittee to conduct their own investigation of the complexity of a naval gun situation, I will let you go with me to Senator Ford to ask for the necessary resources before the Rules Committee.

We would probably have to hire, at least, 50 or 60 people for that kind of expertise. I do not recommend that we do that. I think we have the Navy resources, and I think we have the General Accounting Office resources to be able to make sure we have an objective analysis.

In addition, our staff, and we do have only one or two people that have been available, but they have been doing a very fine job of interviewing witnesses and making sure that we have the perspective we need to see that the Navy has done its job. So I would not agree that we should hire our own investigators, which would be many in number, and would be more or less single purpose. I think we have to use existing resources, rather than spend that kind of money.

Senator DIXON. Well, may I say respectfully, if the Chair would yield for just a moment, that what I am suggesting is that we ought to have either a subcommittee or an ad hoc committee representing this committee that would have the jurisdictional authority to look into these questions. We could use the FBI, the General Accounting Office and other government agencies' expertise, to help us draw the conclusions that we draw.

I have a problem with the services making their internal investigations and filing reports that many of us have concerns about, Mr. Chairman.

Chairman NUNN. Senator Dixon, I said in my opening statement that we are going to have the FBI testify. We have already asked for the General Accounting Office. They have been investigating this for several weeks. And we are hearing from the Navy. We also are thinking seriously of getting the laboratories involved in terms of the tests. So we are going to do a thorough analysis. We are going to have outside people. That is already being done, and I hope I have made that clear.

Are there any other opening statements? Senator McCain.

Senator MCCAIN. Mr. Chairman, I would just like to say that for about 200 years, when there has been an accident or incident, the relevant services that had the expertise has investigated with the oversight of Congress.

Since the Reorganization Act following World War II, it is the Department of Defense that oversees and reviews. We have, by various legislative acts, appointed a few hundred inspector generals, auditors, et cetera, to oversee these things. To now shift that role and burden to Congress—I believe, we already have about 8,000 staffers around here, I think it would be foolishness to start with. And second, a clear departure from the traditional oversight role of Congress.

With all due respect to my friend from Illinois, I understand his frustration. To take on a burden of that kind of investigation, we would have to go out and hire people like those that are here today. This is an incredibly technical area that would require, I would say a few 100 additional staff, who were competent to investigate this kind of thing. I do not know what they would do the rest of the time.

Chairman NUNN. They would have to have their own laboratories too.

Senator DIXON. I think we would have to get some appropriations for a laboratory for the Senate investigating committee as well.

The reason why it annoys me, frankly, Mr. Chairman, it somehow impugns the integrity and the judgment of professional people, who have been involved in this kind of activity for years. I just do not accept that.

Chairman NUNN. Senator Glenn.

Senator GLENN. Thank you, Mr. Chairman.

I want to thank you and Senator Warner for holding the hearing. Senator Metzenbaum and I joined Senator Warner and the other people who were interested in having these hearings in calling for them.

I believe it is essential we hold these hearings, first, in fairness to the families of the 47 men who lost their lives. Six of those men were from Ohio, and in fact three, I believe, lived within about 10 miles of each other; a tragic loss.

Second, in fairness to those men and women who are at sea today. And third, in fairness to the Navy, which has the responsibility for the safety of the personnel and the responsibility for ensuring the combat readiness of our naval forces.

Mr. Chairman, after a briefing by the Navy investigating team in September, I expressed some reservations about some of the conclusions reached by the team. I do not question the thoroughness of the investigations that were done, but I did question some of the conclusions. I have basically two related concerns.

First, given the numerous weapons-related safety and training deficiencies that existed aboard the *Iowa* on the day of the explosion, the Navy's report describes these deficiencies as, and I quote, "a foundation for disaster."

Is the Navy correct in concluding then that the explosion was most likely caused by a wrongful, intentional act? Second, given these deficiencies, is Gunnersmate Second Class Clayton Hartwig being unfairly blamed?

Regarding these deficiencies, Mr. Chairman, the investigating team's own report cites a lack of proper supervision of weapons personnel, poor adherence to explosives safety regulations, and a lack of effective weapons training.

One of the most glaring safety deficiencies was the conduct of live firing experiments by using an unauthorized powder and projectile load in turret II, all without the knowledge or approval of the ship's captain. I know experiments and follow-ups have been done during the investigation in all these areas, but let me cite just a few more deficiencies.

On the day of the explosion, unauthorized experimental powder loads were also planned for turret III. The powder that exploded in turret II had been improperly stored during the spring and summer of 1988, prior to delivery to the *Iowa*.

The sailor running the rammer in turret II, the equipment that pushes the powder into the gun barrel, was not formally qualified for the job and had never conducted a live firing exercise.

Of the 37 positions manned in turret II involving power-operated handling equipment or personnel involved with explosive devices, only 9 of the 37 men had the required annual non-nuclear ordnance certification.

Only 13 of the 51 personnel in turret II at the time of the explosion were fully qualified under the PQS system, the Personnel Qualification Standards, for their watch station. And neither the commanding officer, the executive officer, the weapons officer, nor the gunnery officer knew of the large number of watch stations being manned by personnel not qualified under the PQS program.

It is because of these and other documented deficiencies relating to leadership and training in explosive safety regulation that make it difficult for me, at this point, to accept the conclusion that the explosion was most likely caused by a deliberate act, and to question the Navy's finding that Petty Officer Hartwig was the person most likely to have committed that act.

With the information we have been given, at least so far, that is a greater leap of faith to a conclusion that I can confidently make.

Now, of equal importance, Mr. Chairman, is the question: Does the state of operational readiness aboard the *Iowa* at the time of the accident reflect the state of readiness of other ships in the fleet today? A related question is: Does the recent rash of Navy accidents indicate a decrease in fleet operational readiness similar to the *Iowa*?

I ran through some of the safety and training deficiencies identified in the *Iowa* investigation, but the report also identified a shortage of key personnel in turret II that concerns me, especially as chairman of the Manpower and Personnel Subcommittee.

The ship's manning document identifies 90 positions to be filled in turret II during live gunnery exercises. Now, on April 19, only 56 positions were filled, but allowing for the 9 positions that were not required on April 19, that still leaves turret II manning on the day of the accident at 72 percent of required personnel.

Of even greater concern is the shortage of key senior enlisted ordnance supervisors aboard *Iowa*—first class and chief petty officers. The ship's manning document requires a total of 26 senior petty officers, 11 chiefs and 16 first class petty officers. Aboard the *Iowa* on April 19 there were only six chiefs (55 percent of the requirement) and five first class (33 percent of the requirement).

So, Mr. Chairman, on any given day there are an average of some 235 Navy ships deployed around the world, with approximately 110,000 sailors and 7,000 marines embarked. These hearings need to answer the question, "was the state of operational readiness aboard *Iowa* on April 19 indicative of the readiness of the rest of the fleet today?"

Another question that needs to be answered is "what can be learned from this tragic accident?" In this regard, I am reminded of the terrible accident aboard the aircraft carrier, the U.S.S. *Forrestal,* in July 1967 in the Tonkin Gulf, in which 134 men lost their lives. Our good friend and colleague on this committee, Senator McCain, was aboard the *Forrestal* that day and was injured in the fire and the explosions on the flight deck, and retired Navy Capt. Milt Beach, behind me here this morning, was in an A-4 squadron aboard that same ship at that time.

My point is that there were many safety and training lessons learned as a result of the *Forrestal* tragedy. The implementation of these lessons has saved countless Navy lives over the last 22 years. In fact, the outstanding job done by the *Iowa's* crew in fighting the fires and controlling damage is due in no small measure to the fire fighting and damage control training they received, training that was expanded by the Navy after the *Forrestal* fire.

So, like the *Forrestal*, we must learn from this tragic accident aboard the *Iowa*.

Mr. Chairman, I am hopeful we can answer these and other important questions related to the *Iowa* tragedy during the course of these hearings. And again, I want to thank you for holding them, and look forward to the testimony of our witnesses.

Thank you.

Chairman NUNN. Thank you, Senator Glenn. Any other opening statements?

Senator LOTT. Mr. Chairman, I would like to hear the statement from the Navy.

Chairman NUNN. I think that is a good suggestion.

Without objection, Admiral Milligan.

STATEMENT OF REAR ADM. RICHARD D. MILLIGAN, U.S. NAVY, INVESTIGATING OFFICER, ACCOMPANIED BY CAPT. JOSEPH D. MICELI, U.S. NAVY, DIRECTOR, TECHNICAL SUPPORT TEAM; AND ROBERT J. POWERS, DIRECTOR, CRIMINAL INVESTIGATIONS, NAVAL INVESTIGATIVE SERVICE

Admiral MILLIGAN. Mr. Chairman, good morning. I appreciate this opportunity to appear before you today to discuss my investigation into the tragic incident aboard U.S.S. *Iowa* on April 19, 1989, that cost the lives of 47 of my fellow servicemen.

I have with me on my right, Capt. Joe Miceli, who headed up my technical support team; and on my left, Mr. Bob Powers, representing the Naval Investigative Service.

I have a prepared statement, Mr. Chairman, which, with your concurrence, I would like to enter into the record.

I am prepared, for the benefit of the committee, to present an overview of the accident and my investigative process, after which I would be prepared to answer your questions.

Chairman NUNN. All right. We would be delighted to hear whatever you have. We do not want you to cut your statement short. So you go right ahead with whatever you believe we need to know.

Admiral MILLIGAN. Thank you, Mr. Chairman. I will proceed with my presentation.

On April 19, the day of the accident, I was named by the convening authority, Vice Adm. Joe Donnell, Commander, Naval Surface Force, U.S. Atlantic Fleet, as the investigating officer.

As directed, I was to conduct a "one officer" investigation in accordance with the manual of the Judge Advocate General. Specifically, my task was to determine and then use the most effective means of collecting all relevant information, and then build from that information my findings of fact, opinions and recommendations. Our goal, without question, was to search out and find the cause of this tragic incident so that action could be taken to ensure that it never happened again. In doing so, I would identify any fault, neglect or responsibility for the explosion.

It is important to note that for the purpose of a JAGMAN investigation, findings of fact must be as specific and as indisputable as possible, supported by evidence as enclosures to the investigation. Opinions, on the other hand, are those of the investigating office and are logical inferences or conclusions which flow from the facts. My investigation report complies with the JAGMAN procedures.

Opinions 55 and 56 of my report state that the explosion on April 19 resulted from a wrongful, intentional act, and that the act was most probably committed by Gunnersmate Second Class Clayton M. Hartwig. I will explain what facts led to the formulation of those opinions.

It must be noted that JAGMAN guidelines require, to the extent possible, that the investigating officer, in investigations of this type, identify cause and responsibility for the incident, including personnel involved and the extent of their involvement.

I arrived on board *Iowa* on the 20th of April off of Puerto Rico. I immediately conducted my initial inspection of turret II, and sighting the enormity of the damage, called for technical support in the form of explosive experts and fire marshals. That team was developed on the 20th of April and was headed up by Captain Miceli.

It grew to over 50 explosive and ordnance experts, representing the Army, the Navy, the Armed Forces Institute of Pathology, the Federal Bureau of Investigation, and the private sector, plus hundreds, literally hundreds of support personnel in the field.

The technical team conducted over 20,000 tests in an unprecedented search for the cause of this tragedy.

Simultaneously, my immediate investigating team inspected the damage in search of a cause, interviewed over 82 witnesses aboard the ship, reviewed shipboard programs, which I will discuss, and examined literally hundreds of documents and photographs.

We worked closely together and in coordination with my technical support team.

I must say, Mr. Chairman and members, that I did not go into this investigation considering foul play as a reasonable likelihood.

On May 8, 3 weeks into the investigation, with our review of shipboard programs and our technical effort still ongoing, obviously we had not found a cause for the explosion, but our efforts were far from complete, I received a copy of a letter from Mrs. Kubicina, the sister of one of the deceased. That letter surfaced an insurance issue.

Specifically, an accidental death policy on her brother's life, Petty Officer Hartwig's life, for the value of $100,000. Petty Officer Truitt, a survivor from the magazine in turret II was the beneficiary of that policy.

A few days earlier I had learned of Petty Officer Truitt's involvement in an auto theft back in 1987.

I must point out, while Mrs. Kubicina's purpose was to seek help in getting assistance for her parents to become the beneficiaries of that insurance policy, I had to consider, with the information I had, the possibility of a criminal act.

The convening authority at that time, Admiral Donnell, immediately requested the Naval Investigative Service to open a case with regard to this incident.

From May 8 on, the efforts of my immediate team, my technical support team, and the Naval Investigative Service proceeded in parallel and in coordination. The results of these three parallel investigation efforts drove me to my investigation conclusions. Let me review some of the facts.

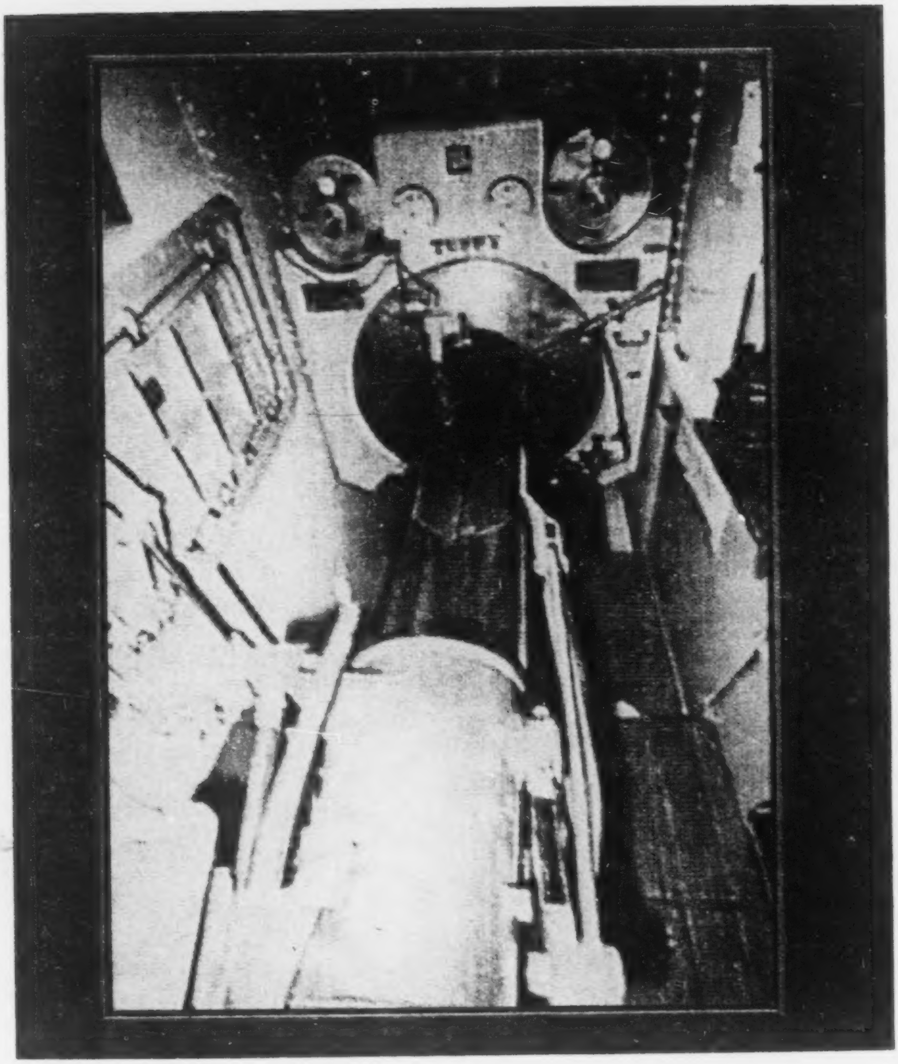
I know the explosion was initiated in the breech of the center gun of turret II. I know the breech was open. I will show you shortly the situation just prior to the explosion and a loading sequence, using visual aids and a tape.

I know the 2,700 pound inert projectile had been successfully rammed into the breech. It is rammed at a rate of 13.5 feet per second. I also know that five bags of propellant were rammed into the breech. It is rammed at 1.5 feet per second. I know that the cradle was extended into the breech. And I know that the rammer, under the control of the gun captain's hand signals, was extended 42 inches into the breech, 21 inches past the normal powder ram position. This pushed the five bags of powder up against the base of the projectile in the breech.

We have conclusive evidence, through duplication of the event, that initiation of this explosion took place in the area of, or between, bags one and two, just behind the projectile inside the breech.

This is a position where procedures call for the placing of two lead foils that serve as a de-coppering or cleaning agent.

I will now walk through some visual charts and a brief video to show you the situation in the gun room, just prior to the accident, and also the loading procedure.


TUPPY

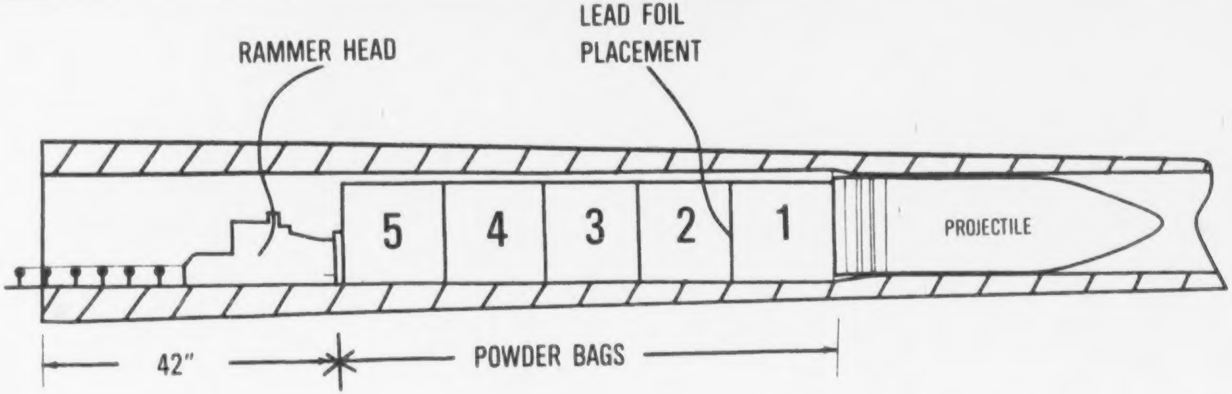
This is the gun room, the typical center gun room, with the breech open, the tray extended. The platform down nearest to the breech is where the gun captain, in this case Petty Officer Hartwig, would be stationed. The platform just aft of that—and we are looking in from the back of the gun room—is where the cradle operator would be stationed.

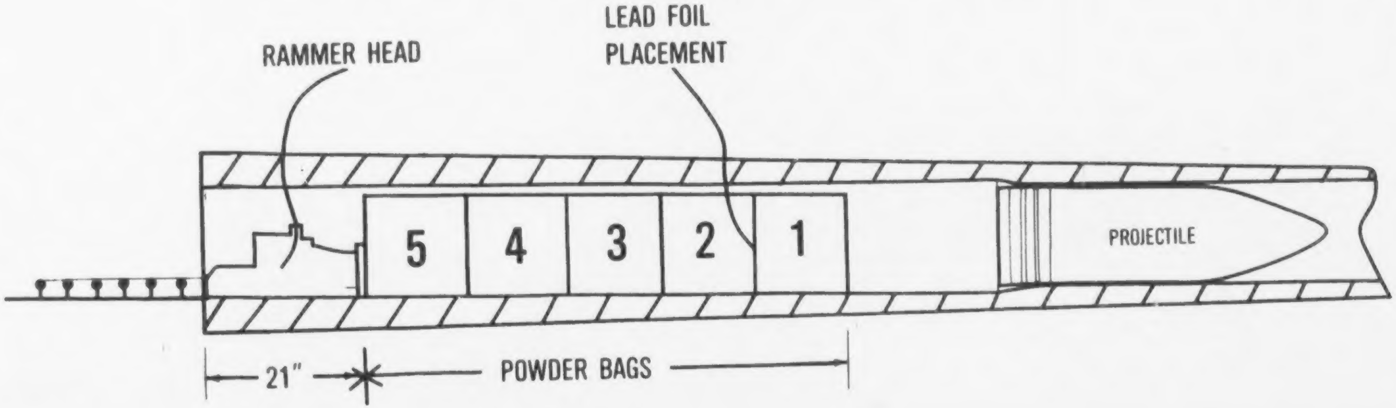
Over here on the left is the rammerman's position. Down below in the gun pit is the fourth man of the gun crew, the primerman.

Just prior to this explosion the projectile had been rammed into this breech, five bags of powder were rammed into this breech, the cradle was extended as you see it here, and the rammer was also spread out, the chain across the cradle and the rammerhead 42 inches into the breech.

This door to the left is the door that the powder bags are rolled out through. That door was closed as it is shown in this picture.

BREECH CUT AWAY





It is very important to understand where the powder bags were at the time of this explosion. This chart shows two cutaways of the 16-inch barrel. In both cases the projectile is properly rammed into the breech. In the normal ram, as shown in the lower cutaway, the rammer would stop 21 inches in from the face of the breech, and that is where the last bag would be placed. Then when the breech is closed, the ignition pad on the last bag is right up against the mushroom of the breech, and you would get the best chance of a successful firing.

In the case of the *Iowa* on April 19, as shown in the upper cutaway, the rammer was 42 inches in past the face of the breech, the head 21 inches in past where it should have been, pushing the five bags up against the base of the projectile.

I mentioned the lead foil which serves as a de-coppering and a cleaning agent. Those lead foil packages are placed in between bags one and two. That is what the tech manual says is the place to put those lead foils.

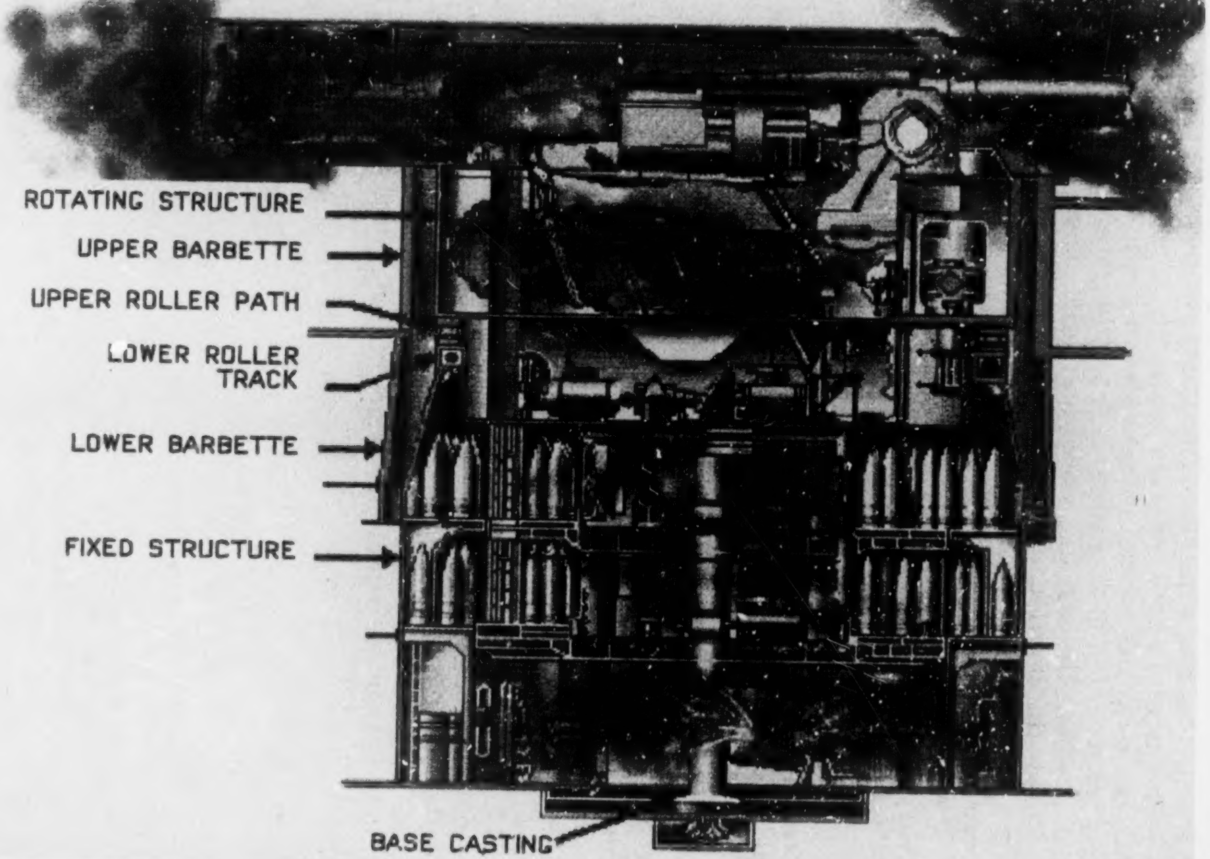
[Admiral Milligan demonstrated using a video tape.]

We are watching a loading sequence. We will get into the fact that it should have been three or a total of six bags of propellant, but those two bags are rolled out and the gun captain will then signal the rammerman to ram the powder home into the breech at 1½ feet per second or a slower rate, and you see that happening at this time.

The rammerman is watching that signal. His position is slightly elevated. He cannot see into the breech. He follows the hand signal of the gun captain. The gun captain is charged with loading the gun.

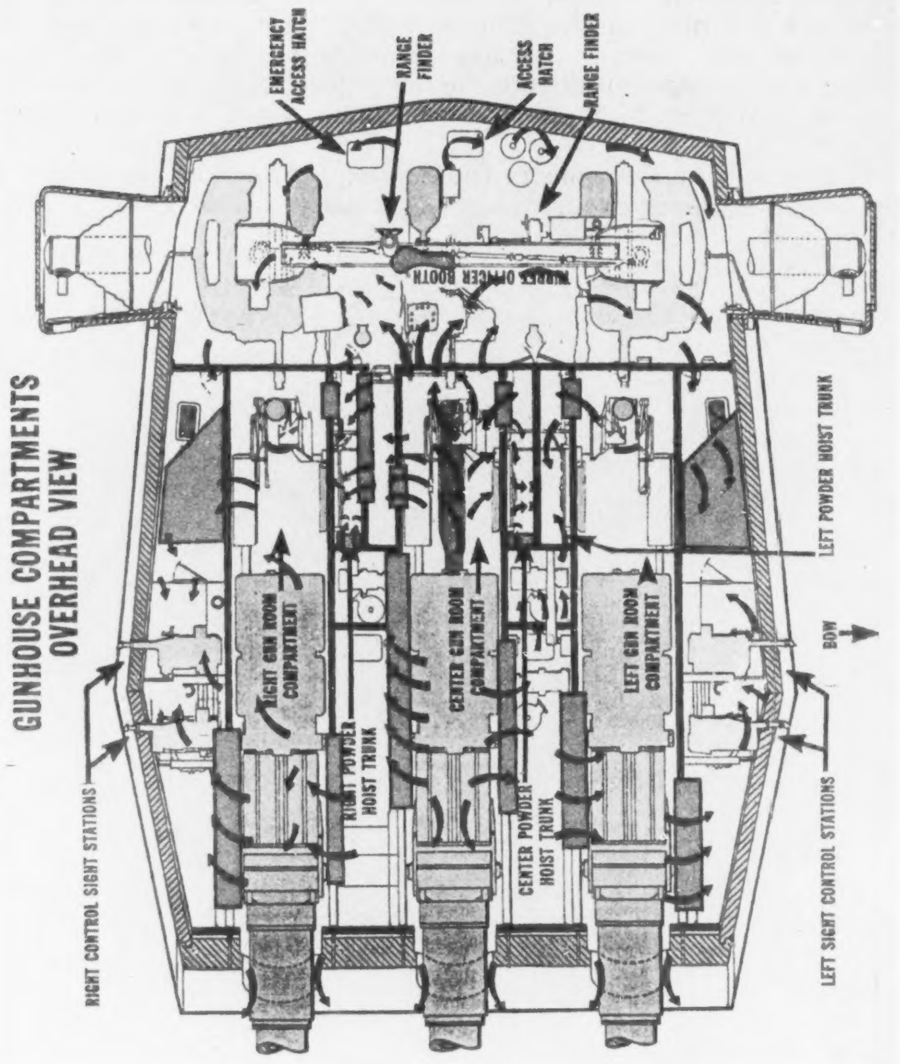
It is at that point that the explosion took place onboard *Iowa* on April 19.

TURRET GENERAL ARRANGEMENT



I mentioned that the explosion took place inside the center gun inside the breech. It blew out in the form of a shaped charge. It blew out the after bulkhead or door of the gun room and into the turret officer's booth position. Simultaneously it blew down through the powder hoist into the lower level of the turret which is where 21 of the 25 bags of powder pre-staged for later firings burned.

So, we had the five bags in the gun explode and 21 bags down at the lowest level of the turret burn as a result of this accident.



GUNHOUSE COMPARTMENTS OVERHEAD VIEW

EMERGENCY ACCESS HATCH
RANGE FINDER
ACCESS HATCH
RANGE FINDER
TURRET OFFICER BOOTH
RIGHT GUN ROOM COMPARTMENT
CENTER GUN ROOM COMPARTMENT
LEFT GUN ROOM COMPARTMENT
RIGHT POWDER HOIST TRUNK
CENTER POWDER HOIST TRUNK
LEFT POWDER HOIST TRUNK
BOW
RIGHT CONTROL SIGHT STATIONS
LEFT SIGHT CONTROL STATIONS

This is a vertical view of the turret. Again, the explosion came back out aft from the center gun of turret II. It actually blew through the bulkheads into the other gun rooms and down through all three powder hoists essentially filling the entire turret instantaneously with the heated explosion and the fire.

This was a 2,500 to 3,000 degree explosion with a velocity of 2,000 feet per second and with a pressure of 4,000 pounds per square inch. The area of the turret, the entire turret, the volume is 47,000 cubic feet. The estimated volume of the blast is 200,000 cubic feet or four times the volume of the turret to give you an idea of the pressure that was built up in the turret.

Also, the projectile that was in the gun, the 2,700 pound projectile at the time of the accident, was moved 42 inches up into the rifling as a result of the explosion.

As I mentioned earlier, my investigation included three parallel efforts. I will now address the principal issues and facts developed from each.

Can you hear me, Mr. Chairman?

Chairman NUNN. Yes, if you could just talk as closely as possible, but I think we can hear all right, thank you.

Admiral MILLIGAN. Our review of shipboard programs looked at manning, and that has been mentioned here already today. Yes, there were overall shortages in the manning on board *Iowa*, but the ship was manned much the same as all ships in the Navy.

The point is that turret II was adequately manned for the exercise that they were conducting on board *Iowa* on April 19.

We looked at training which has been mentioned. The personnel qualifications standards programs, which is the base line training program in the Navy—yes, we did find significant administrative deficiencies in the execution of that program within the weapons department on board U.S.S. *Iowa*.

However, the gun crew of the center gun was a qualified or competent crew. The gun captain, Petty Officer Hartwig, and the cradle operator were fully qualified under the PQS, personnel qualifications standards program.

The rammerman lacked only the firing of an actual exercise to be fully qualified under that program, and he has to do it first sometime. He had, in fact, practiced the ramming procedure, and he had observed actually 14 live firings from inside the gun room.

The primerman, the last man in the gun room itself, was relatively new on board and was not qualified, but the gun had been properly primed for this particular firing.

We also found in looking at the training programs that the damage control people lacked familiarization with the interior of the turret, and the turret is, in fact, a magazine with explosive projectiles within the turret.

However, I must point out that the damage control people, many of them responding almost instantaneously to this accident, performed admirably and some heroically.

We looked at the safety programs on the ship as previously mentioned. The pre-fire briefings were not well attended, and they were not well conducted. Misfire procedures were not briefed.

We know that spark-producing devices which are not allowed inside the magazine were, in fact, inside turret II on the 19th of

April. The ship was not at general quarters. It was at what we call gunnery stations. Materiel condition Zebra, which should have been set was set within the turret, but it was not uniformly set. There were a couple of violations of materiel condition Zebra.

We looked at the sprinkler system for turret II. One serves the rotating part of the turret. It is connected to the fixed part of the ship by a jumper hose. That hose was connected but was not pressurized.

The issue with the sprinkler system is that no one activated that system before the explosion, and we know that conclusively. What that tells us is that no one in the gun room or in the turret saw or was aware of any fire prior to the explosion itself.

We looked at procedures. It is well known that turret I, which had fired before turret II's explosion, did have a misfire.

Chairman NUNN. Admiral, could I ask you one question here. You say no one knew that anything was wrong, in effect, before it happened, is that what you are saying, by the sprinkler not being——

Admiral MILLIGAN. What I tried to say, Mr. Chairman, was no one observed fire in that gun room prior to the explosion, or they would have activated the sprinkler system.

Chairman NUNN. I do not want to interrupt you, but just one question on that. That seems to be based on the premise that everyone in that area could have themselves called in to play the sprinkler system. Is that the case?

Admiral MILLIGAN. There are a number of places within the gun room to activate the sprinkler system. All the people in the gun room have that within their reach.

Chairman NUNN. So, all of them could do it?

Admiral MILLIGAN. Yes, sir, they can, but we know conclusively that it was not activated because there is a storage tank up in the turret, and it had not been activated. Had it been activated, that tank would have been emptied out into the piping, and that had not been done.

We know there was a misfire in turret I and the fact that during the action in turret II, turret I had a foul bore in the left gun. That misfire did not contribute in any way with the accident in turret II.

In my experience as a battleship commanding officer, I have experienced misfires and I worked the issue with regard to clearing misfires while I proceeded firing other guns on the ship.

We know that the ship was firing unauthorized loads. They were firing with five bags instead of six bags of powder, and they were also using a specific lot of powder, D-846, as you probably have seen the term, which was not to be used with the large 2,700 pound projectile. Mr. Chairman and members of this committee—had this explosion or accident taken place with the breech closed, you would have to look very closely at that being the possible problem. This accident took place with the breech open. The fact that there were only five bags instead of six bags in the breech did not play as a cause for this accident.

We looked at the watch quarter and station bill. We found an informal manning document for the turret. We were able conclusively to identify where everyone was on station in the turret, what their station was, in fact.

We looked at ordnance handling certification and other programs in the Navy to help us in our safety procedures. We did find that program in being on the ship, but it was not very well executed. Many of the people handling ammunition had not been so certified.

While these shipboard program deficiencies are troublesome, the fact is the explosion took place after the loading process had reached the point where the propellant was inside the breech. The gun was loaded with the exception of withdrawing the rammer, withdrawing the cradle, and closing the breech.

Issues of manning, training, safety programs and procedures could not and did not cause this accident or the loss of life.

After conducting over 20,000 tests using propellant from the specific lot from *Iowa*'s magazine, my technical support team found no plausible accidental cause for ignition. Specifically we established that the materiel condition in turret II was excellent prior to the explosion. There was no mechanical or electrical problem that could cause ignition.

As I mentioned, we conducted event duplication and proved ignition was between bags one and two behind the projectile inside the breech. We reconstructed the rammer system and proved the rammer was still pushing ahead against the propellant bags at the time of the explosion and that the rammer was, in fact, 21 inches past the normal ram point.

We tested for propellant stability. We used the powder from the magazines of the *Iowa*, the same powder that was stowed on the barges at Yorktown over the summer months of 1988. We tested for stabilizer and found no sample where the stabilizer was below the minimum standards of the Navy.

We also conducted what we call the fume test, the standard Navy test for propellant stability. That test requires that propellants from the propellant bags be kept under 150 degree Fahrenheit temperature continuously until they fume. If they fume in less than 30 days, the life of that propellant is less than 2 years, and it is removed from Navy inventory.

I would point out that we have never in the history of bagged guns in the U.S. Navy had to remove any propellant from inventory because of stability. The specific test of the *Iowa* ammunition, the same propellant that was on the barges, were put under the fume test on May 5 and they have not fumed, and we have got to be on the order of 5 months or over 150 days. If they go past 30, it is stable—excuse me, 192 days Captain Miceli tells me.

We found the propellant on board *Iowa* to be stable and to be safe. Propellant stability was not the cause of the explosion.

We looked at every conceivable ignition source that we could think of or that was brought to our attention.

The burning ember theory, we ruled that out because turret II had not fired on April 19. The gun was cold. The gas ejection air system in the turret was operating properly, and that is a system that blows hot gases or any kind of debris out of the gun before you load it. The relative wind that could have, if even conceivably, carried a hot ember from turret I to turret II was such that it would have blown it past turret II. And also, it was 4 to 8 minutes from the last firing of turret I and the explosion in turret II, much longer than a hot ember has ever stayed hot in any of the tests we have conducted.

Also, the projectile had been rammed into the gun, which would have smothered anything that was there. We ruled out the burning ember theory.

We looked at the possibility that the primer could go off and cause the accident prior to closing the breech. The primer was, in fact, removed from this gun, and it had not fired.

We looked for hazards to electromagnetic radiation to ordnance or signals from radars or radios and its impact on the propellant. We found no hazardous potential at the breech of the gun.

We also looked at ESD. There have been a number of accidents in the history of bagged ammunition from ESD or electrostatic discharge. All of those previous events took place outside of the gun while the propellant was being handled inside the cans. Nevertheless, we tested an ESD event, 360 kilovolts were put to this propellant, 14 times more than the human body can build up. We did not get a reaction from that test.

Friction—and friction, I am sure, we will discuss further. We tested every possible friction event we could, sliding friction, shear test. We slid bags over propellant in the tray. We sheared propellants. We sheared them in all the different angles, longitudinally, horizontally, and on an angle. We got no reaction from those tests that could be duplicated anywhere near the parameters of the gun system.

The ramming test, I mentioned ramming powder bags over the black bags. We rammed it over all the different metal surfaces that are involved in the gun system. We did it dirty and we did it clean.

We did a cocked bag test. We actually rammed the bag and said, could it possibly have been cocked in the loading process? We cannot get one to stay cocked, but could that have ever happened? We just destroyed the bag. We got no reaction from the black powder or from the propellant.

We tested the bag itself, the silk material and the polyurethane jacket that goes around it that serves as a lubricant when we fire the gun. We found we could only light those materials with direct flame, not through friction. We also found that they had very low thermal conductivity and would not transfer heat through them into the propellant within the bag itself.

We did compression tests. Was this an over-ram event? Did we ram the propellant in there too fast and cause it to explode? We rammed it 100 times at 1½ feet per second, and we got absolutely no reaction. We did this all up at Dahlgren.

We then rammed it 10 times at 13½ feet per second, which is way over the speed that we should use. We got no reaction from the high-speed ram, other than we rammed the rammer right into the last bag of the train. We broke the bag. We spread the propellant all over the place, but we did not get any explosive reaction from either the black powder or the propellant.

We did the drop test. We did it at 40 feet, but we also dropped from a 100-foot tower onto a steel plate embedded in concrete using ammunition taken out of the magazines of the *Iowa*.

The first drop was on the red end of the bag, or the ignition pad, black powder ignition pad end, and the bag was broken but no reaction resulted. We then did it on the back end with the same result. Then we did it on the round side of the bag and we totally destroyed the bag. However, we got no explosive reaction whatsoever.

We looked at personnel error. Could a lighter have been thrown into the breech? We knew spark-producing devices were in the turret. We knew that was a violation of ordnance procedures.

So we tested. We tried to ignite propellant and black powder by putting the lighter in there. We had 1½ minutes, roughly, from the time of the load order to the time of the explosion, and we could not get through the bags any ignition of the black powder or the propellant inside of that time. In fact, the black powder took us 9 minutes to get it to burn with the lighter right underneath it.

Another personnel error issue that I must address is the rammer, because the position of the rammer, 21 inches too far into the breech, pushing the propellant bags up against the projectile, is a very significant issue with regard to this investigation.

Whether that was a deliberate act or an error, the simple ramming of the rammer 21 inches too far could not cause this explosion, and we proved that by ramming it up there 100 times at slow speed and 10 times at high speed.

Again, after 20,000 tests, we found no plausible accidental cause for ignition.

Addressing now the Naval Investigative Service investigation which commenced on May 8, a total of 143 agents world-wide conducted well over 300 interviews.

Initially, they looked at the service records and the personal effects of all the people in turret II, the survivors as well as the deceased. Because of the insurance issue that had been brought to my attention from Mrs. Kubicina's letter, because of what we found in some of the lockers, and results of some interviews, the Naval Investigative Service early on narrowed the focus of their investigation down to Petty Officer Hartwig and Petty Officer Truitt.

It is important to remember at this point that the explosion takes place inside the breech of the center gun. One has to take a look at who has access and who has opportunity to do something, and it is the gun captain who has that access and that opportunity.

He is the one who controls the loading of the gun up in the gun room. He controls the ramming of the propellant and the projectile with his hand signals to the rammerman. He is the one who places the lead foils, two of them, in between the first and second bags in the propellant chain.

We know that Petty Officer Hartwig was technically capable of building explosive devices. The Naval Investigative Service investigation at this point narrowed down to Petty Officer Hartwig.

Why do I say he was technically capable? We know that he had a long history of interest in explosives, and that is clearly documented in the report. We know from his personal effects that he had literature with regard to the construction of explosive devices.

We know that he was a qualified gunnersmate, about a 3.6 to 3.8 sailor, had been to gunnersmate A school, had been to basic electricity and electronics school. He was a knowledgeable person. He had discussed with many on how to make explosives.

At that point we put my technical team in support, in direct support of the Naval Investigative Service effort in trying to determine what explosive device might have been involved, if there was one.

On June 22 we got into a very important part of the investigation, the identification by the metallurgist at the Norfolk Naval Shipyard that we had found foreign material in the rotating band of the *Iowa* projectile.

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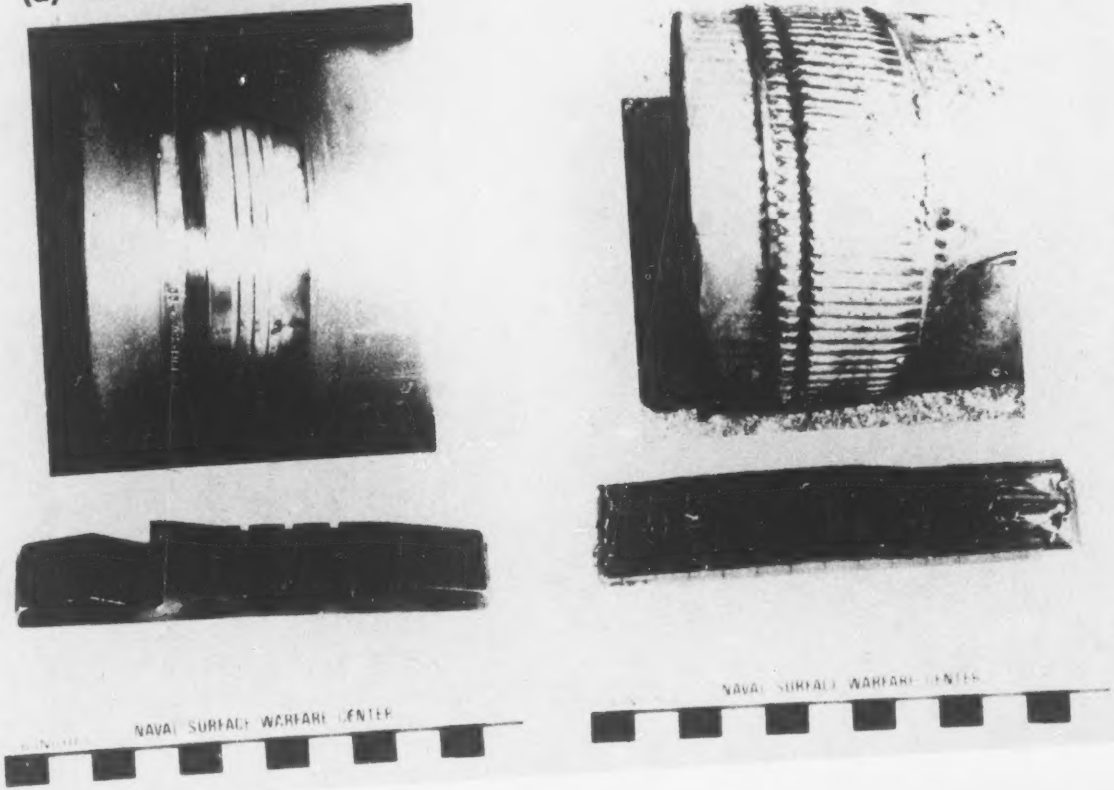
ROTATING BAND, 16-INCH PROJECTILE


(a) UNFIRED CONDITIONS

(b) FIRED CONDITIONS

Admiral MILLIGAN. What I have here is two projectiles. The one on the left has not been rammed into the breech, and the one on the right is the one that has been rammed into the breech and into the rifling of the barrel.

Down below is a cutaway of the one that is a new projectile, it has not been rammed, and the cutaway of the rammed one. The area that we are talking about is this crevice right here that serves as a seal.

When the explosion takes place in the gun to fire the projectile out through the bore, it seals the explosive gases behind the projectile and also grooves into the rifling of the barrel to give the projectile the rotation it needs for stability in flight. It is in that crevice, open at the time of the explosion and closed microseconds later as the projectile moves forward, that we are looking to find foreign material.

What Commander Swanson has here is just a part of one of these rings. The one he has in his hand now is the one that has not been fired and the crevice is the large groove closest to his body as he carries it around.

Captain Miceli has another, and this is from a 48-inch long ring that circles around the 16-inch projectile. The one he has is the one that has come off the projectile that has been fired up into the rifling then removed from the gun. It is one where the crevice has been closed.

[Pause.]

Admiral MILLIGAN. Mr. Chairman, we will be able to discuss exactly what that ring does. Let me just finish my remarks—I am getting near the end—and then we will take your questions.

Having found the foreign material on June 22, we proceeded on. I will come back to that issue just very briefly here.

In the meantime, the characterization of Petty Officer Hartwig was building from the hundreds of interviews that were being conducted by the Naval Investigative Service. We found that he was a person of limited friendships, and you have probably seen this before, many witnesses saying that he was basically a loner; an introverted person, a man of somewhat low self-esteem and a man of professional illusions, and we can get into further details on those later.

There also is evidence of an alleged suicide gesture back in his boyhood days, and that he had in fact, with about four people on his ship, had discussed suicide just as an issue.

What we do have is a profile by an FBI psychologist who opined that Petty Officer Hartwig took his own life and hoped that it would look like an accident. That is from an equivocal death analysis by the FBI psychologist, and it is looked at in the overall investigative process as exactly that—an equivocal death analysis.

We asked the FBI to look at the foreign material as an outside observer, and the Naval Investigative Service did that. Their report was basically inconclusive, and it recommended that we do further scientific scrutiny and further investigative scrutiny of what we had in our rings before we came to any further conclusion.

We did that. We did much further examination out at the Naval Weapon Support Center at Crane, Indiana, and it supports strongly the presence of foreign material with very convincing evidence, and that report has just recently been released and has been submitted by myself to the Chief of Naval Operations and on to the Judge Advocate General.

This further investigation, of investigative scrutiny, so to speak, has led us to a chemical device as being the device that would most closely match up to the foreign material that we found in the *Iowa* band, and we can discuss that further if you would like.

Mr. Chairman, my summary has been somewhat extensive to provide the committee with some of the facts of my investigation. It is these facts, taken in their entirety, that drove me to the conclusion of my report and opinions number 55 and number 56. As I said earlier, I did not seek this conclusion. I was driven to it by the facts.

I have great sympathy for the families of all of our lost shipmates. I can understand the burden experienced by the Hartwig family, and I wish that I could have come to a different conclusion.

Sir, that completes my remarks and I and my two team members are prepared to answer your questions.

[The statement of Admiral Milligan follows:]

STATEMENT OF

REAR ADMIRAL RICHARD D. MILLIGAN, USN

MR. CHAIRMAN, DISTINGUISHED MEMBERS OF THE COMMITTEE, I AM REAR ADMIRAL RICHARD D. MILLIGAN. I WAS THE OFFICER ASSIGNED TO INVESTIGATE THE EXPLOSION WHICH OCCURRED IN NUMBER TWO TURRET ON BOARD USS IOWA ON 19 APRIL 1989. I APPRECIATE THIS OPPORTUNITY TO APPEAR BEFORE YOU TODAY TO DISCUSS THAT INVESTIGATION.

SHORTLY AFTER THE EXPLOSION, INDEED, ON THE VERY SAME DAY, VICE ADMIRAL J.S. DONNELL, III, COMMANDER, NAVAL SURFACE FORCE, U.S. ATLANTIC FLEET, DIRECTED ME TO CONDUCT AN INVESTIGATION INTO THE TRAGEDY.

SPECIFICALLY, I WAS DIRECTED TO CONDUCT A "ONE OFFICER" INVESTIGATION IN ACCORDANCE WITH PROCEDURES SET FORTH IN THE MANUAL OF THE JUDGE ADVOCATE GENERAL, CHAPTER V, PART C. IN NAVY JARGON, THIS IS CALLED A JAGMAN INVESTIGATION. THE PROCEDURES FOR SUCH AN INVESTIGATION DO NOT NORMALLY INCLUDE THE USE OF A HEARING. I WAS REQUIRED TO DETERMINE AND USE THE MOST EFFECTIVE METHODS OF COLLECTING, ANALYZING, AND RECORDING ALL RELEVANT INFORMATION.

IN THAT REGARD, INVESTIGATING OFFICERS DETAILED OR APPOINTED IN ACCORDANCE WITH NAVY JAG MANUAL PROCEDURES ARE NOT BOUND BY FORMAL RULES OF EVIDENCE. THEY MAY INCLUDE IN RECORDS OF

INVESTIGATIONS ALL RELEVANT MATTERS OF REASONABLE AUTHENTICITY. IN PERFORMING MY INVESTIGATIVE FUNCTION, I HAD THE AUTHORITY TO EMPLOY THOSE METHODS I FOUND MOST EFFECTIVE. AS SOON AS POSSIBLE, I WAS TO REPORT MY FINDINGS OF FACT, OPINIONS, AND RECOMMENDATIONS CONCERNING A NUMBER OF ISSUES, INCLUDING THE CAUSE OF THE EXPLOSION AND ANY FAULT, NEGLECT, OR RESPONSIBILITY FOR IT.

FOR PURPOSES OF JAGMAN INVESTIGATIONS, THERE IS AN IMPORTANT DISTINCTION BETWEEN FINDINGS OF FACT AND OPINIONS. FINDINGS OF FACT MUST BE AS SPECIFIC AND INDISPUTABLE AS POSSIBLE. EACH FINDING OF FACT MUST BE SUPPORTED BY REFERENCE TO A SPECIFIC ITEM, OR SPECIFIC ITEMS OF EVIDENCE ATTACHED TO THE REPORT AS ENCLOSURES. INVESTIGATING OFFICERS' OPINIONS, HOWEVER, ARE LOGICAL INFERENCES OR CONCLUSIONS WHICH FLOW FROM THE FACTS. OPINIONS ARE SUPPORTED BY CITATION TO THE FINDINGS OF FACT FROM WHICH THEY ARE DERIVED. FOR EXAMPLE, A FINDING OF FACT MAY STATE MERELY THAT A CERTAIN WITNESS SAYS HE OBSERVED AN EVENT. A RELATED OPINION MAY THEN INFER OR CONCLUDE THE EVENT ATTESTED TO BY THE WITNESS OCCURRED.

ALLOW ME TO CALL YOUR ATTENTION TO CERTAIN OF MY OPINIONS. THOSE ARE NUMBERED 55 AND 56 IN MY REPORT, IN WHICH I STATE MY OPINIONS THAT THE EXPLOSION RESULTED FROM A WRONGFUL INTENTIONAL ACT, AND THAT THE ACT WAS MOST PROBABLY COMMITTED BY GUNNER'S MATE GUNS SECOND CLASS CLAYTON M. HARTWIG. I WILL EXPLAIN WHAT FACTS LED TO FORMULATION OF THOSE OPINIONS.

I ARRIVED ABOARD IOWA ON 20 APRIL 1989 AND IMMEDIATELY CONDUCTED MY INITIAL INSPECTION OF THE DAMAGE TO TURRET TWO. BASED ON THE ENORMITY OF THE DAMAGE I OBSERVED, I IMMEDIATELY CALLED FOR ADDITIONAL TECHNICAL ASSISTANCE. IN RESPONSE TO THAT REQUEST, THE CONVENING AUTHORITY, IN COORDINATION WITH COMMANDER, NAVAL SEA SYSTEMS COMMAND, PROVIDED ME WITH A TECHNICAL SUPPORT TEAM UNDER THE DIRECTION OF CAPTAIN JOSEPH D. MICELI, USN. FOR THE MONTHS TO FOLLOW, THIS TECHNICAL SUPPORT TEAM CONDUCTED INSPECTIONS, TESTS, AND ANALYSES DESIGNED TO PROVIDE EVIDENCE THAT COULD ASSIST ME IN DETERMINING THE CAUSE OF THE EXPLOSION. THE TEAM RECEIVED SUPPORT FROM OVER 50 EXPLOSIVE AND ORDNANCE EXPERTS IN THE NAVY AND ARMY, AS WELL AS EXPERTS IN VARIOUS DISCIPLINES FROM THE ARMED FORCES INSTITUTE OF PATHOLOGY, THE FEDERAL BUREAU OF INVESTIGATION, AND FROM THE PRIVATE SECTOR. IN ALL, MY TECHNICAL TEAM CONDUCTED OVER 20,000 TESTS IN AN UNPRECEDENTED SEARCH FOR A CAUSE FOR THIS TRAGEDY.

SIMULTANEOUS TO MY TECHNICAL TEAM'S EFFORTS, I CONDUCTED INTERVIEWS OF WITNESSES ABOARD AND ASSOCIATED WITH USS IOWA, AND WITH THE SUPPORT OF A GROUP OF SEVERAL OFFICERS AND ENLISTED PERSONNEL WHO COMPRISED MY IMMEDIATE INVESTIGATIVE SUPPORT STAFF, REVIEWED RELEVANT SHIPBOARD DOCUMENTS, RECORDS, AND PHOTOGRAPHS. EIGHTY TWO WITNESSES EVENTUALLY TESTIFIED, UNDER OATH, BEFORE ME AS INVESTIGATING OFFICER, AND I PERSONALLY EXAMINED HUNDREDS OF DOCUMENTS AND PHOTOGRAPHS.

AS THESE TWO INTERRELATED INVESTIGATIVE EFFORTS EVOLVED, I WAS LOOKING FOR THE CAUSE OF WHAT I SUSPECTED WAS AN ACCIDENT. SHIPBOARD SAFETY AND ORDNANCE HANDLING PROCEDURES, MANNING, TRAINING, POWDER STABILITY, AND MECHANICAL ISSUES WERE THE PRIMARY FOCUS OF OUR INITIAL EFFORTS. I DID NOT GO INTO THIS INVESTIGATION CONSIDERING FOUL PLAY A REASONABLE LIKELIHOOD. THREE WEEKS INTO THE INVESTIGATION, HOWEVER, ON 8 MAY 1989, I LEARNED THAT A SURVIVOR OF THE IOWA EXPLOSION HAD BEEN LISTED AS A BENEFICIARY TO A SIZEABLE ACCIDENTAL DEATH INSURANCE POLICY ON THE LIFE OF ONE OF THE MEN WHO DIED. IN MY MIND, THIS SUGGESTED THE POSSIBILITY OF CRIMINAL ACT THAT HAD TO BE THOROUGHLY INVESTIGATED.

AT THIS POINT IN THE INVESTIGATION, THE 8TH OF MAY, NO REASONABLE ACCIDENTAL CAUSE FOR THE EXPLOSION HAD BEEN IDENTIFIED, ALTHOUGH TESTING CONTINUED. ALSO, SEVERAL DAYS EARLIER, I HAD LEARNED THROUGH NAVAL INVESTIGATIVE SERVICE (NIS) AGENTS ASSIGNED IN NORFOLK, VIRGINIA, THAT ONE OF THE SURVIVORS OF THE TURRET II EXPLOSION HAD BEEN THE SUBJECT OF A FELONY AUTO THEFT INVESTIGATION A COUPLE YEARS PREVIOUSLY. DURING THE COURSE OF THE NIS INQUIRY INTO THAT INCIDENT, THE PERSONAL EFFECTS OF THAT SUBJECT WERE SEARCHED ON BOARD USS IOWA. BLACK POWDER OF THE TYPE USED IN SIXTEEN INCH GUN POWDERBAGS WAS FOUND IN HIS LOCKER. THAT SAILOR WAS THE SAME MAN IDENTIFIED AS THE BENEFICIARY OF INSURANCE PROCEEDS IN THE EVENT OF ACCIDENTAL DEATH OF GUNNER'S MATE GUNS SECOND CLASS CLAYTON M. HARTWIG, THE CAPTAIN OF THE GUN THAT HAD EXPLODED.

GIVEN ALL OF THIS, I IMMEDIATELY RECOMMENDED TO VICE ADMIRAL DONNELL, THE OFFICER WHO HAD CONVENED THE JAGMAN INVESTIGATION, THAT A SEPARATE CRIMINAL INVESTIGATION BE UNDERTAKEN. THAT DAY, HE REQUESTED THE NAVAL INVESTIGATIVE SERVICE TO COMMENCE SUCH AN INVESTIGATION.

AS NIS BEGAN TO COLLECT EVIDENCE, I RECEIVED ROUTINE PERIODIC ORAL AND WRITTEN REPORTS OF ITS PROGRESS. IN FACT, I EXCHANGED INFORMATION WITH THE NAVAL INVESTIGATIVE SERVICE AND WITH MY TECHNICAL SUPPORT TEAM THROUGHOUT THE COURSE OF THE INVESTIGATION. IN WRITING MY OWN REPORT, I CONSIDERED ALL EVIDENCE THEN COLLECTED BY NIS ALONG WITH THE INFORMATION THEN REPORTED BY THE TECHNICAL SUPPORT TEAM AND BY MY IMMEDIATE SHIPBOARD TEAM.

TAKEN TOGETHER, THE RESULTS OF THESE THREE PARALLEL INVESTIGATIVE EFFORTS DROVE ME TO MY INVESTIGATION CONCLUSIONS. I KNOW THE INITIAL SOURCE LOCATION OF THE EXPLOSION IN TURRET II OCCURRED IN THE CENTER GUN. AT THE TIME OF THE EXPLOSION, THE LOADING PROCESS WAS ONGOING, THE CENTER GUN BREECH WAS OPEN, THE LOADING OF A 2700 POUND INERT PROJECTILE HAD BEEN COMPLETED, AND FIVE BAGS OF PROPELLANT (NALC D846) WERE RAMMED INTO THE BREECH. ALSO, THE GUN'S CRADLE WAS EXTENDED AND THE RAMMER, UNDER THE CONTROL OF THE GUN CAPTAIN'S HAND SIGNALS, WAS EXTENDED 21 INCHES TOO FAR INTO THE BARREL OF THE GUN. THIS PRESSED THE FIVE PROPELLANT BAGS AGAINST THE REAR OF THE PROJECTILE. IN THE NORMAL COURSE OF EVENTS, THE GUN CAPTAIN PLACES TWO LEAD FOILS BETWEEN BAGS ONE AND TWO - THAT IS, THE

TWO BAGS FARTHEST INTO THE BARREL AND CLOSEST TO THE PROJECTILE. THESE LEAD FOILS SERVE AS A DE-COPPERING AGENT AND HELP TO CLEAN THE GUN. TECHNICAL TESTS WHICH DUPLICATED THE EVENT HAVE PROVED THE EXPLOSION ORIGINATED IN THE AREA OF BAGS ONE AND TWO - WHERE THE LEAD FOILS ARE TO BE PLACED - AND WE HAVE STRONG AND CONVINCING EVIDENCE THAT SOMETHING FOREIGN TO THE NORMAL PROPELLANT CHARGE WAS IN THAT CHARGE ON THE 19TH OF APRIL. THROUGH EXHAUSTIVE TESTING, I AM CERTAIN OF THE STABILITY OF THE PROPELLANT AND BLACK POWDER. WE FOUND NO TECHNICAL CAUSE FOR THIS EXPLOSION AND ALTHOUGH WE FOUND DEFICIENCIES IN A NUMBER OF IMPORTANT SHIPBOARD PROGRAMS, WE FOUND NONE THAT COULD CAUSE THIS ACCIDENT.

ONE HAS TO REMEMBER THIS EXPLOSION TOOK PLACE INSIDE THE OPEN BREECH OF THE CENTER GUN. EVERYTHING UP TO THAT POINT IN THE LOADING SEQUENCE HAD BEEN SUCCESSFULLY CARRIED OUT. THE TURRET II CENTER GUN CAPTAIN WAS GUNNER'S MATE GUNS SECOND CLASS CLAYTON M. HARTWIG. PETTY OFFICER HARTWIG HAD AN INTEREST IN SHIP DISASTER AND EXPLOSIONS, WAS FOUND TO HAVE POSSESSED A "HOW TO" MANUAL FOR MAKING EXPLOSIVES AND A BOOK OF "DIRTY TRICKS," AND FBI PSYCHOLOGISTS CONSIDERED HARTWIG TO BE A TROUBLED YOUNG MAN. THIS EVALUATION WAS CONSISTENT WITH OTHER INFORMATION OBTAINED BY NIS THAT REVEALS PETTY OFFICER HARTWIG WAS NOT ONLY A COMPLEX , BUT, IN THE VIEW OF SEVERAL WITNESSES, INCLUDING FAMILY AND FRIENDS, ALSO A TROUBLED YOUNG MAN.

THE SHIPBOARD PROGRAM AND TECHNICAL PORTIONS OF THIS INVESTIGATION WHICH I HAVE ALLUDED TO CLEARLY DEMONSTRATE THAT AN ACCIDENT DID NOT CAUSE THIS EXPLOSION. IT WAS NOT CAUSED BY UNSTABLE PROPELLANT. IT WAS NOT CAUSED BY A DIRECT FLAME OR SPARK. IT WAS NOT CAUSED BY FRICTIONAL HEATING, OR BY IMPACT AND COMPRESSION. IT WAS NOT CAUSED BY ELECTROSTATIC DISCHARGE. IT WAS NOT CAUSED BY HAZARDS OF ELECTROMAGNETIC RADIATION. IT WAS NOT CAUSED BY THE KIND OF PROCEDURAL ERRORS OR NEGLIGENT ACTS CREWMEMBERS MIGHT HAVE MADE.

WE DETERMINED THIS TO BE SO EVEN THOUGH MY SHIPBOARD TEAM UNCOVERED DEFICIENCIES IN DOCUMENTATION OF SHIPBOARD TRAINING, VIOLATIONS OF SAFETY RULES, AND USE OF IMPROPER PROCEDURES. FOR EXAMPLE, SAFETY RULES PROHIBIT CREWMEMBERS FROM BRINGING CIGARETTE LIGHTERS INTO THE TURRET. WE FOUND CIGARETTE LIGHTERS IN THE TURRET. NAVY REGULATIONS REQUIRE DOCUMENTATION OF TRAINING ACCORDING TO A PERSONNEL QUALIFICATIONS SYSTEM, WHICH WE CALL PQS FOR SHORT. WE FOUND DEFICIENCIES IN DOCUMENTATION OF PQS TRAINING. THE GUN WAS LOADED WITH FIVE BAGS OF PROPELLANT, WHICH WAS OF A LOT, OR TYPE, AND AMOUNT NOT AUTHORIZED FOR THE PROJECTILE IN USE. PROPELLANT HAD BEEN IMPROPERLY HANDLED IN LONG TERM STORAGE. WE FOUND DEFICIENCIES IN SHIPBOARD MANNING, TRAINING, SAFETY, AND PROCEDURE. EACH OF THESE DEFICIENCIES SUGGESTED A RANGE OF POSSIBLE CAUSES FOR THE EXPLOSION.

MY TECHNICAL SUPPORT TEAM ANALYZED EVERY CONCEIVABLE CAUSE

AND VARIATION OF CAUSES SUGGESTED BY THESE DEFICIENCIES, AND A NUMBER OF OTHERS AS WELL. AFTER OVER 20,000 TESTS USING PROPELLANT FROM THE SPECIFIC LOT FROM IOWA'S MAGAZINES, NO PLAUSIBLE ACCIDENTAL CAUSE OF IGNITION COULD BE FOUND. EXAMINATION OF THE MATERIAL CONDITION OF THE DAMAGED TURRET DEMONSTRATED IT TO HAVE BEEN IN EXCELLENT CONDITION AT THE TIME OF THE CASUALTY, WITH NO SIGNIFICANT DISCREPANCIES. TESTING OF PROPELLANT STABILITY SHOWED IT TO BE STABLE AND SAFE. EVIDENCE OF RELATIVE WIND, TIME, AND GAS EJECTION AIR PROCESS, AS WELL AS THE FACT THAT TURRET II HAD NOT YET FIRED ELIMINATED A STRAY BURNING EMBER AS AN IGNITION SOURCE. WE FOUND PERSONNEL WHO HAD RETRIEVED THE PRIMER AND IT HAD NOT FIRED. WE CONSIDERED HAZARDS OF ELECTROMAGNETIC RADIATION TO ORDNANCE, HERO FOR SHORT, AND FOUND A LACK OF HAZARDOUS POTENTIALS AT THE BREECH. WE FOUND THE BAGGED PROPELLANT INSENSITIVE TO RADIO FREQUENCY ENERGY, AND INSUFFICIENT RADIO FREQUENCY FIELD STRENGTH TO HAVE DETONATED THE BLACK POWDER.

WE EXAMINED STATIC ELECTRICITY AS A POSSIBILITY, BUT FOUND THE AMOUNT NECESSARY TO GET A REACTION COULD NOT BE PRODUCED BY A HUMAN OR UNDER CONDITIONS WE KNEW EXISTED IN THE TURRET AT THE TIME OF THE EXPLOSION. WE TESTED NUMEROUS FRICTION EVENTS AND GOT NO REACTION THAT WOULD PLAUSIBLY REPLICATE TURRET II CONDITIONS, EVEN TO FORCES MANY TIMES THOSE CONCEIVABLY AVAILABLE IN THE TURRET. WE CONDUCTED SHEAR TESTS, IN WHICH WE CUT THE PROPELLANT AND SUBJECTED IT TO TREMENDOUS FORCES, AND AGAIN GOT NO REACTION THAT WE PERCEIVED COULD BE

CAUSALLY RELATED TO THE EXPLOSION. EVENT RECONSTRUCTION TESTS PROVED THE RAMMER WAS 21 INCHES TOO FAR INTO THE BARREL AND THAT IGNITION HAD OCCURRED IN THE AREA OF BAGS ONE AND TWO. WE TRIED RAMMING PROPELLANT BAGS FROM THE SAME LOT AS THAT USED IN TURRET II ON 19 APRIL 1989. WE RAMMED THEM AT THE NORMAL SPEED AND THEN AT THE HIGHEST POSSIBLE SPEED AND GOT NO REACTION, OTHER THAN TO CRUSH AND RUPTURE PROPELLANT BAGS. WE DROPPED PROPELLANT BAGS FROM A ONE HUNDRED FOOT TOWER, ON THEIR ENDS AND SIDES, AND ALTHOUGH WE SUCCEEDED IN BURSTING THE BAGS AND SPILLING PROPELLANT OVER THE AREA, THE POWDER DID NOT IGNITE, EVEN UNDER THESE EXTREME CONDITIONS. WE TRIED LIGHTING PROPELLANT BAGS AND IGNITION PADS WITH LIGHTERS AND ALTHOUGH WE OBTAINED REACTIONS, THEY TOOK FAR MORE TIME THAN THE AMOUNT OF TIME WE KNOW WAS AVAILABLE IN THE ACTUAL IOWA EXPLOSION.

YET, AN EXPLOSION DID OCCUR. THAT IS AN IRREFUTABLE FACT. AS OPINION, I FORMULATED WHAT I THEN BELIEVED AND CONTINUE TO BELIEVE WAS THE CAUSE OF THIS EXPLOSION. I RECORDED THAT OPINION AS OPINION NUMBER 55 OF MY REPORT. A DIFFICULT EXPLANATION - AN EXPLANATION THAT I PERSONALLY MOVED TOWARD ONLY WITH THE GREATEST SENSE OF CAUTION AND RELUCTANCE. THE LOGIC, HOWEVER, APPEARED TO ME AS INEXORABLE AND RELENTLESS: IF THIS TRAGEDY WAS NOT AN ACCIDENT, THEN IT MUST HAVE BEEN THE RESULT OF AN INTENTIONAL ACT.

I HAD NOT UNDERTAKEN THIS INVESTIGATION WITH THE EXPECTATION THAT MY STEPS WOULD LEAD ME ALONG SUCH A PATH OR

TO SUCH A CONCLUSION. I NEITHER SOUGHT NOR EXPECTED TO DISCOVER A PERSON AS AN INTENTIONAL PERPETRATOR. IF I EXPECTED ANYTHING, IT WAS TO DISCOVER THAT SOME ACCIDENTAL OR MECHANICAL DISCREPANCY HAD PROVOKED THIS DEVASTATING CALAMITY. I DIRECTED THE MAJOR PORTION OF MY INVESTIGATIVE EFFORTS TOWARD THE DISCOVERY OF JUST SUCH AN ACCIDENTAL OR MECHANICAL CAUSE. YET, INSTEAD OF DISCOVERING THE EXPECTED ACCIDENT, THESE EFFORTS ELIMINATED THE POSSIBILITY. I WOULD HAVE PREFERRED OTHERWISE, BUT MY PREFERENCES ARE NOT DISPOSITIVE. NOW, HAVING RELUCTANTLY FORMULATED ONE DIFFICULT OPINION, ANOTHER, EQUALLY UNPALATABLE ONE REMAINED TO BE RECORDED.

ON THAT MATTER, I EXPRESSED MY BEST JUDGMENT IN OPINION NUMBER 56 OF MY REPORT. THE SINGLE COMMON DENOMINATOR TO KNOWN ANOMALIES DISCOVERED IN THE OPERATION OF THE CENTER GUN OF TURRET TWO IS THE GUN CAPTAIN, GUNNER'S MATE GUNS SECOND CLASS CLAYTON M. HARTWIG, IN PARTICULAR, HIS DUTIES, PERSONALITY, AND CAPABILITIES. FULL EVALUATION OF ALL KNOWN FACTS CONCERNING HIS ACCESS TO THE GUN, OPPORTUNITY TO CONTROL EVENTS, TRAINING, AND TECHNICAL CAPABILITIES, AS WELL AS INFORMATION CONCERNING HIS OVERALL PERSONAL PROPENSITIES LED ME TO THE CONCLUSION EXPRESSED IN THAT OPINION. HE HAD AN INTEREST IN SHIP DISASTERS AND EXPLOSIVE DEVICES. FBI PSYCHOLOGISTS CONSIDERED HIM A TROUBLED YOUNG MAN AND SUICIDAL, BASED, IN PART, UPON THEIR REVIEW OF HIS LETTERS AND STATEMENTS FROM HIS FAMILY, FRIENDS, AND SHIPMATES. HE CONTROLLED THE RAMMING PROCESS. IN THE NORMAL COURSE OF

EVENTS, HE WOULD HAVE PERSONALLY PLACED A SILK PACKET CONTAINING LEAD FOIL BETWEEN BAGS ONE AND TWO, THE VERY SAME AREA FROM WHICH THE EXPLOSION ORIGINATED. AT THE TIME OF THE EXPLOSION, FOREIGN MATERIAL INCONSISTENT WITH A NORMAL IGNITION WAS SEALED INTO THE PROJECTILE. NO ONE FACT LED ME TO FORMULATE THE OPINION. I HAD TO ACCOUNT FOR ALL THE KNOWN FACTS. I CAN CONCEIVE ONLY ONE OPINION THAT RECONCILES ALL OF THOSE FACTS TAKEN TOGETHER.

I REPORTED FACTUALLY AND TOTALLY THE RESULTS OF MY INVESTIGATION. I KNEW THE CONCLUSION, WHEN MADE PUBLIC, WOULD BE THE SOURCE OF CONTROVERSY, AND FOR MANY, OF PAIN AND HEARTACHE. YET I FELT A COMPELLING SENSE OF DUTY, A SENSE OF RESPONSIBILITY TO THE SURVIVING IOWA CREWMEMBERS AND TO THE FAMILIES AND LOVED ONES OF IOWA'S LOST SAILORS, TO ALL NAVY PERSONNEL AND TO THE PUBLIC WHICH THEY AND I SERVE, TO PROVIDE THE MOST COMPLETE, CAREFUL, AND EVENHANDED REPORT THAT I COULD. THE DUTIES OF THOSE WHO SERVE IN THE UNITED STATES NAVY ARE OFTEN UNPLEASANT. MY DUTY WAS TO REPORT MY FINDINGS OF FACT, OPINIONS, AND RECOMMENDATIONS.

WITH REGARD TO THE DISCOVERY OF FOREIGN MATERIAL ON THE PROJECTILE, I HAVE READ INACCURATE REPORTS IN THE PRESS CONCERNING FBI FINDINGS. HERE IS WHAT HAPPENED. AN EARLY WITNESS STATEMENT GIVEN TO NIS SPECIAL AGENTS PROVIDED REASON TO BELIEVE PETTY OFFICER HARTWIG MAY HAVE POSSESSED A STORE BOUGHT TIMING DEVICE. TO TEST WHETHER SUCH A TIMING DEVICE

COULD HAVE PRODUCED THE FOREIGN MATERIAL DISCOVERED ON THE IOWA PROJECTILE, WE WENT TO A COMMERCIAL OUTLET, BOUGHT A DEVICE SIMILAR TO THE ONE IDENTIFIED, AND LATER RE-CREATED AN EXPLOSION IN A SIXTEEN INCH BATTLESHIP TYPE GUN BY PLACING THE TIMER INITIATED EXPLOSIVE DEVICE BETWEEN BAGS ONE AND TWO. WE DID NOT GET AN EXACT MATCH WITH THE FOREIGN MATERIAL FOUND IN THE ROTATING BAND OF THE IOWA PROJECTILE, BUT DID FIND SIMILARITIES. NIS THEN ASKED THE FBI TO PERFORM AN INDEPENDENT ANALYSIS - A "SECOND OPINION," SO TO SPEAK.

CONSISTENT WITH THAT REQUEST, NIS PROVIDED THE FBI WITH PARTS OF FOUR PROJECTILE'S ROTATING BANDS. ONE WAS FROM THE PROJECTILE FROM IOWA'S CENTER GUN, TURRET II. THE OTHER THREE WERE FROM TEST SHOOTS DONE BY MY TECHNICAL TEAM. THE FBI REPORTED TWO CONCLUSIVE DETERMINATIONS. FIRST, POLYMERIC MATERIAL WAS FOUND ON THE IOWA PROJECTILE, BUT DUE TO ITS CHARRED CONDITION, THE FBI COULD NOT IDENTIFY PRECISELY WHAT THE POLYMERIC SUBSTANCE WAS. THE FBI DID NOT REPORT WHETHER OR NOT SIMILAR CHARRED POLYMERIC MATERIAL WAS FOUND ON ANY OF THE PROJECTILES FROM THE TEST SHOOTS, AND HAD PREVIOUSLY INDICATED FURTHER ANALYSIS WOULD BE REQUIRED TO DETERMINE WHETHER THE IOWA PROJECTILE BAND MATERIAL WAS DIFFERENT FROM THE TEST PROJECTILES. SECOND, THE FBI CONCLUDED THAT THIS UNKNOWN POLYMERIC MATERIAL FROM THE IOWA PROJECTILE WAS NOT PAINT FROM THE SAME PROJECTILE.

NIS ALSO PROVIDED THE FBI WITH AN ELECTRONIC DEVICE OF A TYPE SIMILAR TO WHAT THEY THEN BELIEVED MAY HAVE BEEN IN PETTY

OFFICER HARTWIG'S POSSESSION, AND WHICH COULD HAVE BEEN A SOURCE OF DETONATION. THE FBI DETERMINED THAT POLYMERIC MATERIAL FROM THE NIS PROVIDED DEVICE DID NOT MATCH THE UNKNOWN CHARRED POLYMERIC MATERIAL FOUND ON THE IOWA PROJECTILE. THIS INDICATED THE NIS PROVIDED ELECTRONIC DEVICE DID NOT CAUSE THE EXPLOSION. IN THE FINAL ANALYSIS, HOWEVER, THE FBI'S REPORT CONFIRMED THE PRESENCE OF UNIDENTIFIED, CHARRED POLYMERIC MATERIAL ON THE IOWA PROJECTILE. IT WENT LITTLE FURTHER.

IN ITS INITIAL REPORT, THE FBI HAD SUGGESTED FURTHER ANALYSIS WAS NEEDED, SO THE TECHNICAL TEAM EXPANDED THE SCOPE OF THEIR WORK. ADDITIONAL TESTING BY THE TECHNICAL TEAM CONFIRMED THE FBI SUGGESTION THAT THE NIS PROVIDED ELECTRONIC DEVICE DID NOT CAUSE THE EXPLOSION. THAT DETERMINATION NONETHELESS LEFT THE TECHNICAL TEAM WITH UNEXPLAINED FOREIGN MATERIAL PRESENT ON THE IOWA PROJECTILE. MORE TESTS OF INCREASING SOPHISTICATION WERE CONDUCTED IN AN EFFORT TO IDENTIFY THIS MATERIAL.

TESTING CONDUCTED BY NAVAL SURFACE WARFARE CENTER, DAHLGREN, NAVAL EXPLOSIVE DISPOSAL TECHNOLOGY CENTER, NAVAL SHIPYARD, NORFOLK, NAVAL WEAPONS SUPPORT CENTER, CRANE, INDIANA, U.S. ARMY ARMAMENT RESEARCH AND DEVELOPMENT CENTER, AND NAVAL ORDNANCE CENTER, LOUISVILLE, RESULTED IN A FINAL TECHNICAL TEAM REPORT PROVIDED TO ME ON 27 OCTOBER 1989. THIS REPORT CONCLUDED UNIQUE FOREIGN MATERIAL WAS PRESENT ON THE IOWA PROJECTILE. THE REPORT IDENTIFIED THE MATERIAL AS IRON WIRES

COATED WITH CALCIUM, CHLORINE, AND OXYGEN, AND STATED THAT THESE MATERIALS WERE NOT FOUND ON PROJECTILES USED AS TEST, OR CONTROL SHOOTS. THE REPORT CONCLUDED THIS FOREIGN RESIDUE, UNIQUE TO THE IOWA PROJECTILE, COULD NOT BE DUPLICATED BY SIMPLE CONTAMINATION OF THE GUN CHAMBER WITH STEEL WOOL AND OTHER CHEMICALS THAT MIGHT REMOTELY BE PRESENT IN A GUN FIRING. THE REPORT INDICATED THAT SOME TYPES OF NONELECTRONIC EXPLOSIVE DEVICES WOULD PRODUCE THESE FOREIGN MATERIALS ON A PROJECTILE IN AN EXPLOSION OF THE KIND THAT OCCURRED ABOARD IOWA.

IN THAT REGARD, I FOUND NOTHING IN THE FINAL TECHNICAL TEAM REPORT THAT CAUSED ME TO ALTER THE OPINIONS I EXPRESSED IN MY EARLIER INVESTIGATIVE REPORT. TO THE CONTRARY, THAT FINAL REPORT WAS CONSISTENT WITH MY EARLIER REPORTED CONCLUSIONS. I SIGNED MY INITIAL INVESTIGATIVE REPORT ON 15 JULY 1989 BECAUSE, FOR THE MOST PART, WE HAD CONCLUDED OUR TESTING. I COULD NOT SEE ANY FURTHER DEVELOPMENTS THAT WOULD ALTER MY FINDINGS OF FACT, OPINIONS, OR RECOMMENDATIONS. NOW, 3 1/2 MONTHS LATER, I KNOW OF NOTHING THAT WOULD CAUSE ME TO CHANGE MY REPORT.

MR. CHAIRMAN, DISTINGUISHED MEMBERS OF THE COMMITTEE, I WILL CONCLUDE WITH THE FOLLOWING THOUGHTS. WHEN I FIRST STEPPED ABOARD IOWA ON 20 APRIL 1989, I INTENDED TO CONDUCT A REVIEW OF PROCEDURAL, TRAINING, AND MECHANICAL FACTORS IN THE HOPE OF DISCOVERING THE CAUSE OF THIS MAJOR CASUALTY. THAT WAS MY CHARTER AND MY DUTY. IN THE COURSE OF WHAT EVOLVED INTO A BROADER INQUIRY, I FOUND NO MECHANICAL DEFICIENCIES OF

SIGNIFICANCE. I DID, HOWEVER, IDENTIFY DEFICIENCIES IN TRAINING AND PROCEDURES. HOWEVER, I EMPHASIZE THAT WHILE THESE WERE SIGNIFICANT AND OF CONCERN, I FOUND NO CAUSAL RELATIONSHIP BETWEEN THOSE DISCREPANCIES AND THE EXPLOSION. THE NAVY HAS ACTED TO REMEDY THOSE DEFICIENCIES. MY INVESTIGATION ELIMINATED ACCIDENT AND MALFUNCTION AS A CAUSE.

MY INVESTIGATION WAS NEITHER A TRIAL NOR AN INDICTMENT. SUCH A PERCEPTION IS A PHENOMENON OF THE PRESS. IN EVALUATING MY REPORT, IT IS CRITICAL TO UNDERSTAND THE JAGMAN PROCEDURE, AND TO DISTINGUISH FINDINGS OF FACT FROM OPINIONS AND RECOMMENDATIONS. THE BASIC REPORT CONTAINS MY OPINIONS. THE OPINIONS I REPORTED ARE INFERENCES AND CONCLUSIONS DRAWN FROM THE FACTS. AS PREVIOUSLY STATED, I REPORTED THESE OPINIONS FOR TWO BASIC REASONS. FIRST, REGULATIONS REQUIRE ME, TO THE EXTENT POSSIBLE, TO IDENTIFY WHAT I PERCEIVED TO BE THE CAUSE OF THE INCIDENT. SECOND, AND MOST IMPORTANT, I OWED IT TO THE SAILORS WHO HAVE SERVED AND WILL IN THE FUTURE SERVE IN THE UNITED STATES NAVY TO IDENTIFY WHAT HAPPENED IN THAT TURRET ON 19 APRIL 1989. THE PURPOSE OF A JAGMAN INVESTIGATION IS NOT TO CONVICT; IT IS TO DISCOVER AND LEARN. MY REPORT REFLECTS MY BEST EFFORTS IN PURSUIT OF THOSE GOALS. YET, IF THERE EXIST BETTER OR MORE LOGICAL EXPLANATIONS THAN THOSE I HAVE PROVIDED FOR WHAT OCCURRED ABOARD IOWA ON 19 APRIL 1989, I WELCOME THEM.

I AM READY TO ANSWER YOUR QUESTIONS.

Chairman NUNN. Thank you, Admiral. Do either Captain Miceli or Mr. Powers have anything they would like to say at this point?

Captain MICELI. No, sir.

Mr. POWERS. No, sir, Mr. Chairman.

Chairman NUNN. Admiral, you made reference in your statement that your overall code of inquiry basically calls for finding of fact, and you say that they must be specific and as indisputable as possible. Is that right?

Admiral MILLIGAN. Yes, sir.

Chairman NUNN. Then you go on to say that opinions, however, are logical inferences or conclusions which flow from the facts.

Admiral MILLIGAN. Yes, sir. Every finding of fact in my report, by JAGMAN procedures, must be backed up conclusively by an enclosure within that report, and my report now totals something on the order of 298 enclosures that support the findings of fact.

Chairman NUNN. Are you required to come to conclusions, or if the facts were simply too uncertain and not indisputable, would it be within your prerogative simply to say, "I have no opinion"?

Admiral MILLIGAN. I am required to come to opinions, but only those opinions that I, as an investigating officer, feel that I can justify on the basis of the findings of fact.

Chairman NUNN. What if the facts were so confusing and there was no definitive fact, would you feel it was within your power simply to say to everyone concerned, I simply cannot find what caused it?

Admiral MILLIGAN. Yes, Mr. Chairman, I could say that.

Chairman NUNN. You do not feel pushed to come to what you call a conclusion based upon your opinion, then?

Admiral MILLIGAN. What I felt obligated to do was to develop all of the facts that I could, all of the information, and build the findings of fact and then the opinions in the effort, to the best of our ability, to find the cause of this accident so that we could take whatever corrective action was required to ensure that we never experience it again.

Chairman NUNN. But you are not under the code of what we would use in the courtroom, or what you would use in courts-martial, are you? You are in a different kind of circumstance in your investigation, is that right?

Admiral MILLIGAN. It is an administrative process, Mr. Chairman, with the goal of developing all of the information as far as you can possibly go to come to the opinions that are needed.

Chairman NUNN. You do not use criteria like "clear and convincing evidence," or "preponderance of evidence," or "beyond reasonable doubt"? You are not using either civil or criminal terms for your conclusions?

Admiral MILLIGAN. It is an administrative process, not a criminal process. However, all of the findings of fact must be backed up by very supportive and convincing enclosures, or information in the report itself, and my report does that.

Chairman NUNN. I do not want to belabor this, but when you come to an opinion, are you saying that that opinion is probably what happened, or are you saying that that is possibly what happened?

Admiral MILLIGAN. All opinions, of course, cite in the report the findings of fact which those opinions are based on. Some of my opinions, such as opinion number 56, is a "probably" issue based on all of the information.

Chairman NUNN. Let us take two specific ones. You say the incident was a result of a wrongful intentional act. That is an opinion, is that right?

Admiral MILLIGAN. That is correct.

Chairman NUNN. Then you go on to say, "most probably GMC-2 Hartwig was the individual who caused it."

Admiral MILLIGAN. That is an opinion also.

Chairman NUNN. Those are both opinions.

Admiral MILLIGAN. That is correct.

Chairman NUNN. But they are based upon the facts?

Admiral MILLIGAN. They are based upon findings of fact which are then supported by all of the enclosures in the investigation. They are based on literally many, many issues.

Chairman NUNN. Are you excluding the possibility that other things could have happened or could have caused this, when you come to those opinions?

Admiral MILLIGAN. The conclusion I come to——

Chairman NUNN. Are you saying this is one possibility that could have happened, or are you saying this is what you believe probably happened?

Admiral MILLIGAN. I think to answer your question, Mr. Chairman, I have to say that we have excluded all other possibilities and have come to this as the only possible conclusion.

Chairman NUNN. So you have excluded other possibilities?

Admiral MILLIGAN. Yes, sir. All of the programs on the ship, all of the 20,000 tests that we conducted from a technical viewpoint, we found no other cause for this accident.

Chairman NUNN. Senator Glenn listed, and I listed in my opening statement, the various discrepancies in the weapons department on board the U.S.S. *Iowa.* There were a number of personnel discrepancies and a number of things done wrong with a number of bags, and places the bags were placed, and the differences in length as to length from the proper location and so forth.

You are saying that you went into those with enough intensity, or enough scrutiny, to determine none of those were what caused the explosion?

Admiral MILLIGAN. That is correct, sir, as I tried to say in the briefing here.

Chairman NUNN. Were you charged with going further than that and looking into the ship itself and why all of these discrepancies occurred, why all of these breaches of Navy procedures occurred?

Admiral MILLIGAN. I was charged to conduct the investigation with regard to the explosion in turrett II, and I limited my investigation to the weapons department; namely, the 16-inch turrets. I am convinced that the issues that we found, the somewhat disturbing training and safety issues that we found in the weapons department, were not the same in the other departments and that the other departments on the ship are much better run.

Chairman NUNN. How do you characterize the results of the FBI's equivocal death analysis? What is that? Is that an opinion?

Admiral MILLIGAN. Well, it is an equivocal analysis from which an opinion was stated by the psychologist of the FBI.

Chairman NUNN. That is their opinion?

Admiral MILLIGAN. Yes, sir. That is in my report as another data point.

Chairman NUNN. That is based on facts that you gave them?

Admiral MILLIGAN. That is based upon the Naval Investigative Service information that was provided to the FBI.

Chairman NUNN. Maybe Mr. Powers could answer this. Were these findings of fact that you gave the FBI from which they were to derive their opinion?

Mr. POWERS. It was information that we had developed during our investigation, either statements we had taken from people, interviews we had done, or letters that we had recovered, writings that we had recovered that we provided to the FBI.

Chairman NUNN. What I am trying to get at, is if this was a factual foundation that you gave the FBI, or was it your opinion that you gave the FBI?

Mr. POWERS. Our reports did not contain opinions. They are factual based on the information we developed through interviews or seizures of evidence or whatever other means we developed the information.

Chairman NUNN. So the FBI's death analysis was their opinion based on the facts that you furnished them?

Mr. POWERS. Yes, sir.

Chairman NUNN. Not based on opinions you furnished them?

Mr. POWERS. We furnished them no opinions, sir.

Chairman NUNN. Admiral, I just have one more question, and then I will yield to Senator Warner. How did you determine that GMG2 Hartwig wound up as the gun captain for the center gun of turret II when a number of witnesses testified that at morning quarters on April 19 it was announced that GMG2 Lawrence was to be the gun captain and the general quarters watch station bill did not even list GMG2 Hartwig as being in turret II?

Admiral MILLIGAN. Sir, the facts that you stated are all correct and are understood and were available to me at the time of the investigation. I have to say that the people who were involved with that assignment process, of course, were all lost in the accident. I am talking about the division officer and the senior chief who ran that turret.

Unfortunately, there was an unauthorized absentee from the ship at the time they were under way, which left a vacant position up in the center gun; namely the powder hoist, and the man who was on the watch bill to be the cradle operator ended up being the powder hoist operator. That left a man short in the gun room.

This was going to be Petty Officer Lawrence's first live gun shoot as a gun captain, but he did not have a full team. He had done the prefire checks. That is document, but there was not a full team in the gun room. So Petty Officer Hartwig obviously was put in the gun room or introduced himself to assist and take the position of gun captain in the gun room to fill out that team.

There is conclusive evidence that he was, in fact, the gun captain at the time of the incident.

Chairman NUNN. I guess that is what I am asking for. You have given your opinion, but what was the conclusive evidence that he was in fact the gun captain?

Admiral MILLIGAN. Well, of course, his remains were found in the gun room, and Petty Officer Lawrence was on the sound power phones, which are worn by the cradle operator. So Petty Officer Lawrence was in fact the cradle operator.

Chairman NUNN. The fact that Hartwig was found in the gun room and in fact he had been captain before indicates that would have been his position and excluded all other positions?

Admiral MILLIGAN. He was a qualified gun captain, but there is, for instance, proof that he was in a position near the gun and what his position was——

Chairman NUNN. The physical location?

Admiral MILLIGAN. Yes, sir.

Chairman NUNN. Thank you. Senator Warner.

Senator WARNER. Thank you, Mr. Chairman.

Mr. Chairman, I commend you for the manner in which you worked with the witnesses in developing the nature of this hearing. I would just suggest the Admiral revisit one phrase, "administrative, not criminal."

It is an administrative procedure, which is not a judicial one in nature; would you say?

Admiral MILLIGAN. That is correct, Senator Warner.

Senator WARNER. In my recollection in such examinations as this you are independent, and the Navy outlines this very clearly in its manual of regulations; there were no restrictions put on you whatsoever?

Admiral MILLIGAN. Absolutely not. My goal was to find the cause, and I could do whatever I could think of to do to find that cause.

Senator WARNER. I would like to pick up where the chairman left off regarding participation by the FBI.

Information has come to me that the FBI analyst described the quality and the quantity of the information provided by the Navy as being very good. Does that comport with your understanding?

Admiral MILLIGAN. You are referring to the psychologist?

Senator WARNER. Just generally.

Admiral MILLIGAN. I had not heard that, but possibly Captain Miceli did. He talked to them regularly.

Senator WARNER. Perhaps Mr. Powers?

Captain MICELI. I have never heard it before. Is this a recent statement?

Senator WARNER. Yes. It has come to me from a very good source. Mr. Powers.

Mr. POWERS. On the information that we turned over to the behavioral science people, I think they were very satisfied with the information that we had provided them in developing their own opinion.

Senator WARNER. Well, let us turn to another area where apparently there was some difference between the FBI and yourself, Admiral.

The FBI did not—and I repeat, did not—find evidence of foreign material associated with the detonating device. Now, is this a discrepancy?

Admiral MILLIGAN. The statement is correct.

Senator WARNER. Which statement is correct?

Admiral MILLIGAN. That they did not find evidence associated with a specific detonating device. Their report, I would say, was inconclusive and did make specific recommendations that we conduct additional testing, which is exactly what we did.

I see no disagreement between the Navy and the FBI on this issue. We carried it on, of course, much further on their recommendation.

Senator WARNER. Well, what is the reason for the Navy's finding of foreign material, and what is the significance of the FBI observation?

Admiral MILLIGAN. The Navy's strong and conclusive evidence of foreign material is based originally on the metallurgist effort at the Norfolk Naval Shipyard back in the June time frame and then has been carried on through additional testing up until just recently here and further confirmed in a very extensive report by the ordnance activity out at Crane, Indiana.

That foreign material was, indeed, in the rotating band of the *Iowa* projectile removed from the gun in question, and that foreign material best matched the foreign material from a similar band from a test firing that used a chemical detonator type device as an ignition source.

Senator WARNER. What were the components of this foreign material that you believe correlated with the chemical detonator?

Admiral MILLIGAN. Well, there is a number of them. There is wire, there is chlorine. I will ask Captain Miceli to give you the specific details. I think he can anwer it more accurately.

Captain MICELI. The iron wire that we discovered was burned and embedded into the rotating band that we showed you, and on the iron wire there was calcium, chlorine, and calcium oxide. There also were chemistries for glycols and Seal-A-Meal baggies. The glycol, of course, when combined with an oxidizer which is the calcium hyperchlorate, the chemistry of the calcium, chlorine and oxygen, calcium hyperchlorate or HTH, when you combine the glycol and the oxidizer you have an intensifier. An analysis of that residue in our final report reflects those conclusions.

Senator WARNER. Admiral Milligan, the powder bags which were loaded into turret II just prior to the explosion were marked with directions which said, and I quote, "Do not use these powder bags with 2,700 pound projectile."

What is the relationship between the use of those bags and the explosion?

Admiral MILLIGAN. As I had mentioned in the briefing earlier, had this accident taken place with the breech closed and the gun fired, you would have had to take a very close look at that relationship. The accident took place with the five bags in the breech with a 2,700 pound projectile in front of them, but it really made no difference at this point whether it was a 1,900 or a 2,700 pound projectile. The breech was not closed, and the explosion took place.

So although those were procedures that were not proper and the Navy is looking very closely at that issue and taking appropriate action, the fact that you used five instead of six packs and the fact that you used a particular propellant that was not to be used with the specific projectile really did not play and was ruled out as a cause of the accident, and very clearly so.

Senator **Warner**. Thank you, Mr. Chairman.

Chairman **Nunn**. Thank you, Senator Warner. Senator Exon.

Senator **Exon**. Mr. Chairman, thank you very much.

Admiral, thank you for your interesting presentation. I listened to it very carefully.

I remember back when the reactivation of the battleships were under consideration. I was told that 250 men were needed to man each of the 16-inch gun turrets. Yet, it seems that turret II aboard the U.S.S. *Iowa* was manned by 50 or so.

Was I misinformed that 250 men were needed for each turret?

Admiral **Milligan**. The correct number, Senator Exon, is 90 actually. Ninety is the correct number for turret II and turret III. Turret I, I think, is 88 because it does not have a range finder. So the number is 90.

Senator **Exon**. The number is 90, but how many men were assigned to that particular turret? Fifty; is that right?

Admiral **Milligan**. There were 56 people on station in turret II, as I recall, which was below the 90 that would be required. I can explain.

I looked at that very closely as to did that cause or was that a possible cause of the accident? Ninety people is a shipmanning document number, which is really the number required for full battle wartime conditions. It includes manning three of the magazines; putting a lot more people in the annular space around the magazines, in other words, so you could pass powder at a very high rate.

The exercise on board the *Iowa* on the 19th was a limited number of firings. Only one magazine was manned. Only three people were in the annular space, and that is all that was required. That is all you can get there to do that job for one magazine. Frankly, the people on the projectile decks probably were not doing anything because the projectiles that were going to be fired were already moved into the projectile hoist. So there were more than adequate people in turret II to conduct the exercise that was being conducted on April 19.

Senator **Exon**. Somewhere during the extensive reading that I have done on this I recall an allegation that the gunpowder used on the day of this tragedy was gunpowder that was old or older than normal and had been stored for long periods of time. The question was raised whether it should have been used in the first place.

I suspect, because I listened very carefully to your testimony on this, you have actually tested powder from the same source and you found no instability or no reason whatsoever to believe that there was anything unstable about the powder?

Admiral **Milligan**. That is correct, sir. The powder was actually mixed and made in the mid 1940s; however, it is still very stable, and our test convinced us that it was stable and safe.

As I mentioned in the fume test, if it fumes in 30 days we would discard it, but that powder has been under observation now for 192 days, and it has not fumed yet. So it is way safe from the marginal level.

Senator EXON. Regarding the psychological reports that were made after investigation of Hartwig, I am in an area here that I know little, if anything, about. But when someone wants to commit suicide, I would assume that they would want to take their own life but not the lives of others, in this case, their shipmates.

Were there any psychological profiles that you could uncover that would indicate that Hartwig was not only suicidal in tendencies but would not care about or be particularly concerned about taking the lives of others?

In other words, my point is he had to know that if he did what you believe he did to cause this accident, there would be a considerable loss of life. Is that correct?

Admiral MILLIGAN. Yes, sir. He was a capable gunnersmate, and certainly he would know the impact of igniting five bags of propellant. However, I cannot say that he anticipated that that ignition would be as far up into the breech and take that long for the ignition to take place.

The force of the explosion, because it was far up into the breech, was far greater than the impact would have been, say, if it had taken place at the mouth of the breech because of the confined area. This propellant burns faster under pressure, and that was created by the confined area and the fact that the rammer was still pushing the bags into the breech.

If it had been out on the tray, then you would anticipate that the accident results would have been many fewer killed than actually took place on the 19th. This, as I mentioned, was a very high pressure, high velocity, high temperature and high volume explosion which instantaneously caused the death of 47 crew members.

Senator EXON. This foreign material that was found in your investigation in the breech or in the gun barrel was finally identified as some type of a chemical, is that correct?

Admiral MILLIGAN. The best match that we have of the foreign material found in the crevice of the rotating band of the *Iowa* projectile, the projectile taken out of the gun of interest here, is with foreign material from a similar band from a test firing that we used a chemical initiator for an explosive device to initiate the explosion. And that is a very good match.

Senator EXON [presiding.] Thank you. My time is up. I will have some additional questions in the second round. Senator McCain.

Senator MCCAIN. Thank you, Mr. Chairman.

Admiral Milligan, in your professional opinion, as the investigating officer, can you think of any other way this explosion could have occurred? Or has anybody else made a reasonable suggestion indicating another possible reason for the explosion?

Admiral MILLIGAN. Senator McCain, I have to say in all honesty that we looked for another possibility for this accident and we could not find one. And we searched and examined and experimented with every suggestion that came to either my attention or the attention of any member of my team.

Senator MCCAIN. You have exhausted all possibilities?

Admiral MILLIGAN. Yes, sir.

Senator MCCAIN. Thank you.

Let us get back into the foreign substance one more time that was found in the rotating band of the projectile. Clearly, there was a foreign substance found by the Navy.

Admiral MILLIGAN. That is correct.

Senator MCCAIN. Was that substance found by the FBI?

Admiral MILLIGAN. There were, as I recall it, some polymers found by the FBI, but they could not identify them to a timer-type explosive device that we were considering at the time.

Senator MCCAIN. But foreign substance was found by the FBI?

Admiral MILLIGAN. Some polymers, but if I recall it, they classified them as too burned to identify what particular material.

Senator MCCAIN. How do you reconcile the fact that the Navy was able to find some foreign substance, which gave you clear indications, and the FBI was unable to? Mr. Powers, maybe you can illuminate us on that?

Admiral MILLIGAN. Well, let me try first, Senator McCain.

The Navy has, of course, conducted extensive testing on this issue, and the FBI was looking for specific things for us. They looked at three 2-inch sections of the 48-inch band. We gave them half of it, and they looked at three two-inch sections, and after they had cleaned it, they scraped off some material and examined it. They then gave us a report that I understood and still understand as being inconclusive, but not ruling out the presense of foreign material; saying, you had to do more work to confirm that. And we proceeded to do that.

Captain Miceli or Bob, if you want to answer.

Senator MCCAIN. But why did you not go back to the FBI and ask them to conduct further tests of the entire band?

Admiral MILLIGAN. Well, we only had half of the band, because we had already used half, of course, in our own effort. And they had the other half of the band.

Senator MCCAIN. Did they test the same material that you tested?

Admiral MILLIGAN. We invited them, Senator McCain, to do that. I will let Captain Miceli answer that, because he dealt directly with them.

Captain MICELI. I worked very closely with the FBI during this investigation, and I thought that relationship was very professional.

Senator MCCAIN. Good, go ahead.

Captain MICELI. I am here to tell you that we are where we are today with our analysis because of the advice of the FBI.

Before the FBI signed out their letter, I had told them that, based on the scientific methods that they recommended informally, that we were able to rule out the electronic device that was initially suggested. We could, with repeatability and credibility, identify the residue from the PC board, and the dopant on the LED glass, 100 percent of the time, in those rings that had electronic devices fired in them, as part of our replication test.

Based on that information, we were able to rule out conclusively that there were no electronic devices. And I passed that information to the FBI before they signed their letter out.

At the meeting, I also informed the FBI that we were now seeing, with the additional scientific scrutiny, using our suite out at Crane, which I believe is the best in the public sector as well as the private sector in any one collection, we were able to see iron wires with——

Senator McCAIN. Captain, let me, if I could, interrupt. You are not addressing my question, and that is, why is the FBI not now conducting further tests to corroborate your findings?

Captain MICELI. I invited the FBI to come out to Crane to take a look. We did not officially request the FBI to do anything as far as——

Senator McCAIN. Do you not think it would be important to do so, in light of media reports that indicate that the FBI contradicts your conclusions, even though that may not be the case? "The FBI fails to find cause of explosion aboard U.S.S. *Iowa.*" Would it not be important to have the FBI follow up and make the same kind of tests that you did?

Admiral MILLIGAN. Senator McCain, I would have no problem with the FBI going out and looking over everything we did out there at Crane.

Senator McCAIN. Well, I would think you might encourage them to do so, given the fact that there is an apparent—and I emphasize apparent—contradiction here between what you are basing your conclusions or opinions on and what the FBI has found. So I would recommend that.

Admiral MILLIGAN. Yes, sir. And we have a very extensive technical report from Crane, Indiana that is very strong and very conclusive with regard to foreign material. But we will certainly take your advice, sir.

Senator McCAIN. Thank you.

Finally, Admiral, I share the concerns raised by my friend from Illinois and from Ohio, Senator Glenn particularly, about the PQS, the qualifications of the individuals who were performing on those tasks in the gun turrets.

Is it your positive conclusion that while there were probably not enough qualified people there, that that fact was not a contributing factor to this accident?

Admiral MILLIGAN. The real principal issue with the Personnel Qualifications Standards program is the administration of the program. I feel very confident that the people who were manning the individual stations in turret II on April 19 were capable to do the job that they were assigned to do. However, the administration of the program was lacking. The paperwork part of it, let us say.

Senator McCAIN. In other words, you do not conclude that the lack of qualification was a contributing factor to the accident?

Admiral MILLIGAN. That is correct, sir.

Senator McCAIN. Thank you, Mr. Chairman.

Senator EXON. Thank you, Senator McCain. Senator Dixon.

Senator DIXON. Admiral, it is true, is it not, that the media reported to the country at large that Mr. Hartwig was a homosexual?

Admiral MILLIGAN. I have read the same articles that you have, Senator.

Senator DIXON. Yes.

Now, it is also factual, is it not, that your over 100 investigators, who have combed the world and talked to over 300 witnesses, have not one single witness to support that theory?

Admiral MILLIGAN. First of all, my report does not make that qualification.

Senator DIXON. No, but that is my question.

Admiral MILLIGAN. And we have no hard evidence in any part of this investigation——

Senator DIXON. That Mr. Hartwig is a homosexual?

Admiral MILLIGAN. Of such an act, that is correct.

Senator DIXON. As a matter of fact, the one witness you have or did have recanted. The evidence shows that Mr. Hartwig, in fact, dated, I think, an exotic dancer, which is hardly compatible with the habits of a homosexual. All that is correct, is it not?

Admiral MILLIGAN. That is correct that he had dated a dancer.

Senator DIXON. Yes.

Now, Mr. Truitt, I think it was inferred in the media earlier, was a homosexual. He is married, is he not?

Admiral MILLIGAN. He is married, yes, sir.

Senator DIXON. He is alive and he has denied any assertion that he is a homosexual?

Admiral MILLIGAN. Mr. Dixon, I did not classify or even suggest either one of these gentlemen were homosexuals.

Senator DIXON. And is it not true that his wife, as well, has denied that Mr. Truitt is not a homosexual?

Admiral MILLIGAN. I have seen those news reports.

Senator DIXON. Now, your original concerns about Mr. Hartwig began with a letter from his sister, who suggested that a policy of insurance existed upon which Mr. Truitt was beneficiary, and to her dismay, not her family. Is that right? That is your testimony here, that on May 8, I think it was, you first had brought to your attention, this matter. Is that not true?

Admiral MILLIGAN. I received a copy of the letter from Mrs. Kubicina identifying the insurance policy.

Senator DIXON. Now, would you consider it unusual for a—the evidence, I think, also warrants a statement that Hartwig and Truitt were friends, that on leave they generally palled together in ports around the world, and so forth. Is that not also true?

Admiral MILLIGAN. That is true up to a point in time, but the evidence will tell you that that friendship deteriorated significantly in the December 1988 time frame, when Petty Officer Truitt was married.

Senator DIXON. All right.

You are entitled to draw that conclusion if you want to from the evidence, but, in any event, it is a fact that they were good buddies, who spent a good deal of time together as naval persons who took leaves together. Is that not so?

Admiral MILLIGAN. Up until the marriage of Petty Officer Truitt, yes, sir.

Senator DIXON. All right.

Now, would it not be compatible with good general practice for a single person, no wife, no kids, to mention as his beneficiary in a policy of insurance what, at that time, apparently was his best friend? Is that inconceivable to you?

Admiral MILLIGAN. I do not know of that as being a common practice whatsoever.

Senator DIXON. But, would you think it to be uncommon, in view of the fact that he was an unmarried man without children?

Admiral MILLIGAN. My personal opinion is, if I were an unmarried person without any children, I would leave my family as the beneficiaries of my own personal insurance policy.

Senator DIXON. Well, you are entitled to do that, if that is the way you want to do it. I think people could do it another way if they wanted to. There is nothing the matter with it.

Now, your theory also draws a conclusion that Hartwig, this strange person, committed this act to commit suicide. Yet, is it not a fact that all of these investigators, when they looked into this, found that the very night prior to this occurrence, he spent over three-quarters of an hour visiting with a friend about the fact that he looked forward to his next leave in London, and discussing all of the good times he anticipated having in London?

Admiral MILLIGAN. There is information that he had a long discussion with another individual, a surviving gunnersmate from the turret.

Senator DIXON. Yes, the night before.

Admiral MILLIGAN. The night before, concerning—I did not know it as leave, but a potential reassignment to London and what that would be like. However, my investigation has found no conclusive evidence that Petty Officer Hartwig knew he was going to London. In fact——

Senator DIXON. Well, I did not ask you that question. I appreciate your response, and I want the answers to my questions.

Admiral MILLIGAN. Yes, sir.

Senator DIXON. You are certainly a respected investigator and entitled to draw your conclusions, which clearly are contrary to mine.

Now, you further conclude that this individual, on the next morning, having apparently determined the manner of his death, put into play this highly complex method, by virtue of which he blew up that gun and set fire in there and killed, in addition to himself, 46 other members of the *Iowa* crew.

But the fact is, that that very morning he was not listed to be the gun captain in that place. Is that not true?

Admiral MILLIGAN. It is true that I concluded what you said. Yes, that is true. And it is true that he was not on the watch bill. That is true.

Senator DIXON. And what a remarkable thing, I think, that a young man who, the night before, spent over three-quarters of an hour discussing the good time on his next vacation or leave, or whatever you want to characterize it to be, and who, the next morning, was not listed to be the gun captain in that turret, somehow, through some extraordinary manipulation of events, was able to put into play this terrible tragedy that transpired.

I find that difficult, Admiral Milligan, to understand how that could occur.

Admiral MILLIGAN. Mr. Dixon, that is what the facts of this investigation draw you to.

Senator DIXON. But, you see, your own earlier investigation, before you had the letter on the insurance policy, kind of thought maybe it was friction.

Admiral MILLIGAN. We looked at friction, afterwards.

Senator DIXON. And were looking at it to the very day you got the letter.

Admiral MILLIGAN. We looked at it long past the time we got the letter.

Senator DIXON. And, as a matter of fact, in 1924, when the *Mississippi* had a similar accident, it was the conclusion at that time that it was friction.

Admiral MILLIGAN. There has been no friction event in a 16-inch gun or a big-bag gun in the story of the U.S. Navy.

Senator DIXON. This is, in fact, the third accident, the *Mississippi,* a smaller gun on another occasion, and this one. There are at least three occasions when this happened, two times when Hartwig was not the gun captain, is that not true?

Admiral MILLIGAN. We have not had an accident like this on our 16-inch guns, no.

Senator DIXON. The *Mississippi* in 1924 was not a similar accident, using the same kinds of——

Admiral MILLIGAN. It was not.

Senator DIXON. It was not a similar accident?

Admiral MILLIGAN. It was not a friction event, as you said it was.

Senator DIXON. But it was a similar accident, was it not, Admiral?

Admiral MILLIGAN. It was an accident in the breech, yes. It was, either from flare-back or from a burning ember, which we ruled out in this case.

Senator DIXON. I will pursue this in my next round.

Senator EXON [presiding]. Thank you, Senator Dixon. Senator Glenn.

Senator GLENN. Thank you, Mr. Chairman.

I want to go back to your own report on this. Paragraph 58, you talk about some of the communications just before the blowup. And let me read from this paragraph 58.

"Shortly before this explosion Burch,"—and I will not read all the rates here every time—but Ziegler who was the turret captain, Lawrence who was the cradle operator, remember that.

"Shortly, before the explosion, Burch heard Ziegler state over the XJ circuit, which is the intra-turret circuit, left gun is loaded, good job. Center gun is having a little trouble. We will straighten that out."

59: "Mullahey recalls hearing Lawrence state over the XJ circuit, I have a problem here. I am not ready yet." 60: "Additionally, Mullahey recalls that shortly after the explosion, he heard over the XJ circuit Ziegler shout to Lieutenant J.G. Buch," "tell PLOT we are not ready yet. There is a problem in center gun," or words to that effect. Mullahey also recalls hearing Lawrence excitedly restate, "I am not ready yet, I am not ready yet."

Lawrence, a member of turret II center gun crew, was talking on the XJ phone circuit, that is 61.

62: "Burch recalls a period of silence on the XJ phone line before he heard the explosion."

Now, what do we think was going on there? Why do we think that—do we think that somebody saw Hartwig putting something in the gun tray? And they went ahead and put the thing in and shoved the round up in there?

What was going on? And why do we rule all that out as being not indicative that there were other things going on here?

Admiral MILLIGAN. Well, we did not rule it out, Senator Glenn. That is an important part of the investigation. There was obviously something awry in the center gun room.

Senior Chief Ziegler in calling to Lieutenant J.G. Buch, who was the turret captain to tell PLOT we are not ready yet, we have a problem in the center gun, and I will take care of it. It is hard to say exactly what was on his mind, what that problem might have been.

But we are convinced from indisputable evidence that the rammer was, in fact, 21 inches in past where it should have been in the gun. And there was something wrong going on in the center gun room.

I am convinced because no one made any mention of fire, no one made any mention of the word silence, which is the normal procedure when you have a problem in a gun room, that they were not aware that they had an imminent explosion, they did not have any smoke or anything. Because the sprinkler system had not been activated.

But there is no question, there was something wrong in the center gun room. And it was dragging behind the left and right gun rooms by about 25 seconds in the loading process when the explosion took place.

Senator GLENN. You see that is where I have always had a problem coming back and reaching the same conclusion, that you reached out of this thing.

Because there was something wrong, and if somebody had watched Hartwig put something in there, wow, that would have been a reason to stop right then. They would have stopped the whole works, I would presume.

But there was something else going on. I would presume—I do not presume, and maybe you do. But I cannot presume. They say, I am not ready yet, I am not ready yet. And that that would mean, I have got to do something, because Hartwig put something in there he was not supposed to put in there.

That requires a leap of faith I have trouble making on that one.

Admiral MILLIGAN. Well, it is a difficult conclusion to come to with regard to what was wrong in the gun room.

Senator GLENN. No, because to come to the same conclusion the report came to, though, Admiral, you have to assume that what was ready, was that Hartwig was doing something that fouled it up. And they saw it, or they would not have said something on the intercom.

Admiral MILLIGAN. But that conclusion is not based on just the information that was received with regard to communications over the sound powered phones.

That conclusion, or those opinions, opinion 55 and 56, are based on the entirety of this report. There are many, many, many data points that drive, or drove me to the conclusion in writing those two opinions.

Senator GLENN. Well, I understand that. And Senator Nunn pushed the idea of what was opinion and what was fact here.

But this problem where they say in the turret, the people right in there, doing the loading, say they are not ready yet, something is wrong, and in effect, they have got a problem, not ready yet, repeated over again, second time excitedly, your narrative says. And then there is silence, and it blows up.

To come to the same conclusion you came to, I would have to assume, that their being not ready yet and having a problem was a result of something Hartwig was doing. And that is where I just cannot make that leap of reason there.

Admiral MILLIGAN. The nearest thing that I can say right now, which caused the not ready yet, is the fact that we are sitting here with the propellant in the gun, the rammer 42 inches into the gun, and something strange is happening. Because the gun captain is not having that rammer pulled back out of the gun.

Senator GLENN. No, but at that time the rammer was in, the powder bags were in.

Admiral MILLIGAN. That is right. And the rammer was up into the breech. And the next step in that evolution would be to bring the rammer back out. And the rammer was still ahead at the time of the explosion.

Senator GLENN. So at that point, they had not seen Hartwig put something in? And they went ahead with the whole procedure? And this was after that? Is that right? After the powder bags were in?

Admiral MILLIGAN. That is not a bad consideration of what took place. I do not know what Petty Officer Lawrence saw. I do know that the rammer was 42 inches into the breech and was still ahead at the time of the explosion. And that was not where it should have been or under the condition it should have been either.

Senator GLENN. You stated during normal loading sequence Petty Officer Hartwig would have personally placed a silk packet containing lead foil between bags one and two.

What is the accountability procedure of these silk packets? Is it possible that someone else could have placed a detonating device in one of these packets prior to delivery to turret II?

Admiral MILLIGAN. I certainly understand the question, Senator Glenn. And the accountability, although the turret is relatively secure, these packets I believe, in fact, I am sure, have been delivered in old five-inch powder cans. And they set there in the gun room, and they are taken out, placed on the shelf, and put into the gun as the proper time comes to do so.

Where that theory comes apart, however, is that in the gun room—the rammer was 42 inches into the breech. And that was controlled by Petty Officer Hartwig.

So that is where the theory of someone else doing it comes apart. He is the only one who could control that issue. I mean—and that is a very important issue.

Senator GLENN. My time is up, but let me just ask one more question here.

Why do we eliminate the other people that were there, that could have done the same thing? You say Hartwig had a background, he talked about this, talked about suicide and so on, had a technical knowledge. You made a special point of that a while ago.

Everybody in that position in the Navy has received some kind of technical training. A lot of people, and including the other two there, undoubtedly had a how-to knowledge, if they wanted to exercise it.

Everyone who knows something does not go around talking about it all the time. Hartwig did. Maybe the others did not. Why were they automatically eliminated?

Admiral MILLIGAN. Well, I will just start off by saying that the knowledge with regard to building explosive devices is not necessarily a common knowledge of a gunnersmate in the Navy; they are not trained in that field. But Petty Officer Hartwig did have a great interest in that.

Senator GLENN. But do we know the other two did not either, just because they did not talk about it? They may have had just as big an interest and just as much knowledge from Radio Shack or wherever? You do not know. Just because they did not talk about it does not mean to me that they should be eliminated from consideration.

They were on the spot, fully as capable of putting something in there as Hartwig was. Were they not?

Admiral MILLIGAN. No, sir. The only one who has the real access and the real opportunity to put something in the powder train really is the gun captain.

He is right there at the entrance to the gun. He is the one that is pushing those bags forward. He is the one that puts the lead foils in, and he is the one that controls the rammer.

And maybe Mr. Powers would like to add with regard to the other people in the gun room.

Senator GLENN. Who hands him the foil? My time is up, but who hands him the foil?

Admiral MILLIGAN. He reaches back and picks it up off the shelf right behind him. That is the normal procedure.

Senator GLENN. My time is up. Thank you, Mr. Chairman.

Chairman NUNN. Senator Levin.

Senator LEVIN. Thank you, Mr. Chairman.

You talked about data points. Is it fair to say that you feel that there is evidence which raises uncertainty as well as evidence, which leads you to your conclusion?

Admiral MILLIGAN. There is findings of fact, and evidence, certainly. There is evidence to support my findings of fact. And there certainly are findings of fact to support my opinions.

I left my opinion number 56, which is the issue with regard to Petty Officer Hartwig, as the most probable on the basis that there was——

Senator LEVIN. Is there also evidence which raises uncertainty? Those other points, data points you made reference to? There is no certainty here. Is there?

Admiral MILLIGAN. The totality——

Senator LEVIN. Not the totality. Just, is there evidence that raises uncertainties in your mind?

Admiral **Milligan**. There is no evidence that raises uncertainties with regard to the shipboard program review, with regard to all of the——

Senator **Levin**. 55 and 56, is there any evidence which raises uncertainty in your mind relative to 55 and 56?

Chairman **Nunn**. Tell us what those are, Senator Levin.

Senator **Levin**. 55 is that explosion resulted from a wrongful intentional act, and 56 is that it was most probably committed by Hartwig.

Admiral **Milligan**. No, sir. If there was uncertainty I would not have made those opinions.

Senator **Levin**. So, for instance, the material that Senator Glenn went over with you, that we are not ready yet, I have a problem here. That does not raise any uncertainty in your mind at all?

Admiral **Milligan**. They were facts that are in the report that I considered in my opinions and ultimate conclusion. And they were of importance.

And I think they gave me some insight into the fact that there was, in fact, a problem in the gun room. But they do not tell me what the problem was.

Senator **Levin**. My question is, does it raise any uncertainty in your mind? It is a simple question.

Admiral **Milligan**. No, sir.

Senator **Levin**. Thank you. You are certain, also, I think at one point, that the elements found in the timing device and associated batteries were found under the U.S.S. *Iowa* rotating band. Have you changed your view on that?

Admiral **Milligan**. Let me ask Captain Miceli to answer that.

Captain **Miceli**. Would you repeat your question, sir?

Senator **Levin**. You changed your view that elements found in the timing device and associated batteries were found under the rotating band?

Captain **Miceli**. Yes, sir.

Senator **Levin**. You have changed your view on that?

Captain **Miceli**. In the process of the analysis with help from the Army and the FBI, we have ruled out that there was an electronic device with batteries.

Senator **Levin**. That is my whole point. You were certain, back on July 28, that elements found in the timing device and associated batteries were found under the rotating band. And now you are satisfied that that is not so.

Is that correct?

Admiral **Milligan**. Mr. Levin, let me answer that——

Senator **Levin**. I do not need long answers. I just need really short ones. Are you now satisfied that that is not accurate?

Admiral **Milligan**. We are satisfied that it was not an electronics device. I am satisfied foreign material was in the band.

My report is based on foreign materials, sir.

Senator **Levin**. Yes, but your report of July 28, also said that you were satisfied that the elements found in the timing device and associated batteries were found there, which means you were satisfied that there was foreign material consistent with an electronic device.

Is that correct?

Admiral MILLIGAN. If it is read that way, it is not intended that way. My report is based on the fact that there were foreign materials, something foreign to the normal propellant charge in the center gun of turret II on April 19. That is the issue.

Senator LEVIN. You changed your mind in any respect since the FBI report?

Admiral MILLIGAN. No, sir.

Senator LEVIN. Now, going back to the FBI report just for a minute, I understand that you said that you invited them to come back in and look at your new findings about a chemical device instead of an electronic device.

You used the words, invited the FBI to do that. But you did not officially request them.

When you invited them to get back involved, as I believe you should have, since they obviously had an important role here, what was their response?

Captain MICELI. The discussion as I recall it—and I think it was checked also by higher authority with regards to the FBI taking a look at what we were doing—it was an issue of not corroborating other people's work, or looking at other equipment that was used, that they were not familiar with.

Senator LEVIN. Did you invite them?

Captain MICELI. Personally, yes, sir.

Senator LEVIN. Who was it that you invited?

Captain MICELI. I believe the gentleman's name was Mr. Ken Nimmich.

Senator LEVIN. Okay, and he said that they did not think that they could add anything?

Captain MICELI. What he told me and I believe it was verified later at higher levels, both the Navy and the FBI, was that they were not in the business of corroborating other people's work.

Senator LEVIN. But, they were in the business of looking at your first tests, though, right?

Captain MICELI. That was their own analysis.

Senator LEVIN. Did they come in at your invitation?

Captain MICELI. The Navy officially requested the FBI to look at that band, yes, sir.

Senator LEVIN. And they did that even though they are not in the business of corroborating other people's work?

Captain MICELI. That was an analysis that they did at the time that I invited them to come and look. I asked them to come and look at the work that I did. And that is what they were objecting to.

Senator LEVIN. So, if you had just asked them to come and make their own independent analysis to see whether, in fact, their own independent analysis, you think they would have come?

Captain MICELI. I do not know, I expect so.

Senator LEVIN. And did you send them the Crane, Indiana report? Did I name it correctly? Was it Crane, Indiana you said?

Admiral MILLIGAN. It is a report from the weapons center at Crane, Indiana.

Senator LEVIN. Did you send that report to the FBI?

Captain MICELI. They should get one. I do not know if they have received it yet or not. It just cleared the CNO a couple of days ago.

They should receive a copy, if they do not already have it.

Senator LEVIN. But you have not gotten any response from them relative to it?

Captain MICELI. I am not aware of any, sir.

Senator LEVIN. Admiral Milligan. Let me just ask you about the finding 55. You seem to be more certain in finding 55 than you are in 56. Is that fair?

Admiral MILLIGAN. I said most probably in 56.

Senator LEVIN. But not in 55?

Admiral MILLIGAN. That is correct.

Senator LEVIN. And is it also some probability involved in 55?

Admiral MILLIGAN. No, 55 says it was a deliberate act.

Senator LEVIN. That is not probability, it is certainty?

Admiral MILLIGAN. That is my opinion, yes, sir.

Senator LEVIN. My time is up. Thank you.

Chairman NUNN. Let me just announce plans here. We are going to have another round with the committee members. And then, Senator Metzenbaum, if you would like to ask questions, we will do that then. But we will have another round right now, with the people who want to ask further questions. I have a couple of questions.

Admiral, this has been alluded to several times, but let me make sure I understand the sequence here. As I understand it, your technical team initially believed, and maybe this ought to go to the Captain, initially believed that the explosion was caused by friction or compression. And then you later believed it was caused by an electronic device. And you ultimately believe it was caused by a chemical device.

Now, were these really conclusions you reached as you came along? Did you change your opinions as you went along?

Admiral MILLIGAN. Mr. Chairman, let me answer that. The effort was an iterative process. We looked at all of the possible ignition sources and, yes, at one point in time we were looking very closely at friction as a most probable cause, but we conducted all those tests, and we frankly ruled out friction. We could not create a friction event.

Chairman NUNN. Would it be correct to term that as a preliminary inference that you had that it was going to be tested and then you later disproved it after testing, is that the way?

Admiral MILLIGAN. It was a point in the investigation where that is an area we were looking very closely at, but we ruled it out.

Chairman NUNN. But you never concluded that was it?

Admiral MILLIGAN. Absolutely not. We never concluded friction was the cause of that accident.

Chairman NUNN. And the same thing about electronic device?

Admiral MILLIGAN. We were looking at that because of some testimony at a time which was later recanted, but we were looking at it as one possibility. We never concluded that. In fact, my report does not—is not based upon any specific explosive device as initiator. My report is based on the fact that we found foreign material in the propellant charge, material that did not belong there, and not a specific explosive device.

Chairman NUNN. Captain, would you describe the procedures and actions that were utilized to free the projectile from *Iowa's* gun barrel and to remove the rotating band from the projectile?

Captain MICELI. Yes, sir. We had projectiles in the left and right gun also, and they were easily removed with the 750-pound weight that is used to remove the Army projectiles during rehearsal.

We attempted to remove the projectile from the center gun with the same dummy weight, and we were unable to do that. During this process we had put some break-free in the barrel to possibly lubricate the projectile and remove it, and we were unable to do that.

Meanwhile I had received some information from the laboratory that it would take over a million pounds of force to break it loose, and what we had done is we had a meeting with the shipyard design folks, and one of the designers from the shipyard came up with the idea of drilling the projectile out; so we built a jig with a high pressure or low pressure air motor and drilling mechanism, and we drilled, literally drilled the base of the projectile out up from the rotating band.

When that projectile is in the barrel, it has 14,000 psi radial force on the rotating band, so we drilled a 5-inch hole 12 inches deep, and then we expanded it a quarter of an inch each cut, literally drilling the base of the projectile out and then popped the ring loose. It took a week to do the drilling.

Chairman NUNN. It took 1 week?

Captain MICELI. Yes, sir.

Chairman NUNN. Would you explain the potential for contamination that could result from those actions and why do you believe that the contamination did not occur or that it does not undercut the credibility of the report?

Captain MICELI. The rotating band that I showed you is closed. It takes over a million pounds of force to engrave the projectile into the rifling and then when that rotating band is closed, it takes over a million pounds of force to do that.

The amount of opening in what we call the trap or where the rotating band is sealed, the amount of opening after it is sealed is less than five microns. That is equivalent to one grain of fine talcum powder.

The iron wire which we found which has the calcium and the chloride on is 60–80 microns. It would be impossible to fit the wire in the crevice once it is sealed.

Another data point is that the iron wire that we are looking at is burned. It is burned and it is embedded into the trap where it closes.

What we also did to rule out possible contamination, we conducted tests where I had the iron wire put into the chamber. When it was fired we purposely contaminated the rotating band and conducted a test without a chemical device, and the significant difference that we see is that the iron wire does not have the calcium, the chlorine and the calcium oxide or the glycols in the chemistry of the analysis.

We also ruled out all of the fluids, the AFFF fire fighting foam, the ethylene glycol and the water tanks for the sprinkling systems. We looked at the break-free which we had put in the gun as we used to clean the gun. We looked at the hydraulic fluids in the turret, and all of those were ruled out.

We looked at every possible contaminant. We pulled 265 projectiles out of the turret. We examined the rings on those projectiles also to see what types of contaminants were on those rings.

We also found iron wires on those rings. but once again, not burned, no calcium, no chlorine or no calcium oxide or no glycols.

Chairman NUNN. Were you consulted by NIS, Naval Investigative Service, in connection with their decision to submit a portion of the *Iowa* rotating band to the FBI for an independent analysis?

Captain MICELI. Was I consulted by them?

Chairman NUNN. Yes.

Captain MICELI. At this particular part of the investigation, the hat that I had with regard to this analysis, I was supporting and working with the Naval Investigative Service.

Chairman NUNN. So, you knew about it?

Captain MICELI. Absolutely.

Chairman NUNN. You agreed with it?

Captain MICELI. Yes, sir.

Chairman NUNN. Why was the FBI not asked to expand their analysis to include looking for evidence of a chemical ignition device once your tests ruled out the presence of an electronic device and pointed toward the presence of a chemical device?

Captain MICELI. As I indicated, I asked them informally before they submitted their letter, and I do not know. I cannot offer any information with regard to why they were not requested officially. Maybe Mr. Powers can.

Chairman NUNN. Mr. Powers.

Mr. POWERS. I think that from an investigative standpoint when you submit evidence for evaluation and examination to the FBI, they want a first crack at it. They do not want to look at somebody else's work.

We provided them a piece of the *Iowa* band that had not been examined by anybody else, and that is the part that they looked at.

I think what you are asking now is for the FBI to look at the work that Crane did. I think that would have to be a decision that the FBI would have to make because, at least to my knowledge, and I can't answer for the FBI, it basically runs contrary to their policy in their laboratory.

Chairman NUNN. You would not object to it, then?

Mr. POWERS. I would have no objection at all.

Chairman NUNN. Captain.

Captain MICELI. I would welcome it.

Chairman NUNN. Admiral.

Admiral MILLIGAN. I would welcome it also.

Chairman NUNN. Let me ask, Mr. Powers, there has been significant criticism of the Naval Investigative Service in the media concerning this investigation. I want to give you an opportunity to respond. The first one relates to leaks, and the second area has to do with allegations of improper questioning of individuals such as threatening one individual with a charge of murder and accessory to murder if he did not cooperate. Would you first comment on the leaks allegation? Did NIS leak?

Mr. POWERS. I do not believe it was NIS that leaked the information.

One of the problems with any type of investigation of this manner by the first news reports that came out that people are referring to as leaks, we had already interviewed over 50 people and done a number of checks at shops and stores in the Norfolk area. The information could have been gained anywhere.

As a matter of fact, the first information that came out was incorrect, much of it that came out. We looked at our own procedures as to how we were handling the information. We tightened them up independently. It was mentioned that the DOD IG came in and looked at our investigative effort and the leaks.

Chairman NUNN. Did they find where the leaks had come from or did they say anything about NIS?

Mr. POWERS. They did not, but I believe their report said that they did not feel the leaks came from NIS.

Chairman NUNN. They really exonerated you in that report?

Mr. POWERS. In that report they said that they did not feel the leaks came from NIS.

Chairman NUNN. Although they did not come to a definite conclusion?

Mr. POWERS. They did not come to a definite conclusion. I have a copy of the report. I do not know what their exact wording was.

Chairman NUNN. Did that Inspector General report in effect say that the leaks did not come from NIS but were more likely to have come from the naval hierarchy?

Mr. POWERS. What they basically said—and I will read it, Mr. Chairman—"Although it is possible that an NIS employee could have leaked information in circumvention of organizational safeguards, the repeated occurrence of leaks following this dissemination of investigative results from the Navy suggests the possibility of release by a person or persons in Navy entities receiving the case information."

Chairman NUNN. Say the last part again.

Mr. POWERS. "Suggests the possibility of release by a person or persons in Navy entities receiving the case information."

Chairman NUNN. That means Navy hierarchy, does it not?

Mr. POWERS. I do not know what the Inspector General meant by that, but I assume that is what she meant.

Chairman NUNN. Who would have received the information?

Mr. POWERS. Our reports went to the investigative team, and here in Washington they went to the Vice Chief of Naval Operations.

I do want to point out, though, that in an investigation like this we are interviewing hundreds of people. We know that people we were interviewing were being called by the press and were being badgered by the press.

Chairman NUNN. I have been through that. You do not have to convince me. [Laughter.]

Mr. POWERS. And the reporting was, frankly, not very good.

Chairman NUNN. No comment. I will not say whether I have been through that or not. [Laughter.]

Let me ask a question about the threat, the allegation that there was a threat to charge one individual with murder and accessory to murder if he did not cooperate. You know about that?

Mr. POWERS. I have ~~seen~~ the allegation. I have talked to the agents in this particular instance, and they deny ever making any such threat, and I do not believe any such threat was made.

Chairman NUNN. So, you found no evidence that that kind of threat was made?

Mr. POWERS. Absolutely not. I know of no—we had no reason to threaten anybody in this investigation. We were talking to most people—we talked to everybody on a voluntary basis. We had no persons who were providing suspect warning to——

Chairman NUNN. Admiral, let me ask you one question, then I will defer. I have been contacted by one of the families of one of the deceased on the *Iowa*, and the question they have relates to whether the *Iowa* was being used to conduct experiments relating to time delay detonation of underwater explosives during this period. Do you know?

Admiral MILLIGAN. I believe there was a projectile that was being built or tested for that purpose, but it certainly does not play in any way with this accident.

Chairman NUNN. Was there a timer device on board that could have been used in any way to cause this explosion?

Admiral MILLIGAN. No, sir, that timer, that would be in the fuse of the projectile, and it would be a rather large fuse. As a matter of fact, that timer requires the thrust of the projectile to be activated and so I do not see any way that that could be a player.

Chairman NUNN. The other question that was submitted to me—and I want to ask you this question—do you find any evidence that there was a hairline crack that existed in the barrel of the center gun of turret II?

Admiral MILLIGAN. No, sir. We found the turret to be in excellent materiel condition.

Chairman NUNN. If there had been a crack, could that have played any role here?

Admiral MILLIGAN. It would not have played a role. If the gunnersmates or—on any inspection a crack was found, it would have been inspected by the Naval Sea Systems Command, and a determination would have been made whether or not the gun had to be relined, but there was no history of a crack to my knowledge.

Captain Miceli says there was—says Louisville did at one point identify a hairline but insignificant crack in the barrel, but it would not play in this accident.

Chairman NUNN. In other words, if there was a crack there, it would not have anything to do with this accident?

Admiral MILLIGAN. No, sir.

Chairman NUNN. Can you tell us why it would not?

Admiral MILLIGAN. Well, it would be up in the liner, Joe, is that not correct?

Captain MICELI. As I remember the discussion about the crack with one of the fellows who was on my team from Louisville, Louisville has the responsibility of checking the barrels every 100 rounds, and there is a possibility with the pressure that is achieved that some fine cracks do develop, but—and they are inspected for that reason, and I believe that this particular inspection revealed that the condition of the barrel was satisfactory.

However, the crack is up in the liner, it is up in the rifling, and it would not have been—as I recall, I do not think the crack would have been anywhere near the propellant where the ignition occurred.

Admiral Milligan. Mr. Chairman, we will research and I will provide information for the record on that subject.

[The information follows:]

Cracked Gun Barrel Liner Turrett II U.S.S. "Iowa"

Longitudinal cracks 10–30 inches long. .045 inches deep were discovered in turret II barrels in the U.S.S. *Iowa* in December 1986.

Firing of turret 2 guns aboard U.S.S. *Iowa* was restricted by NAVSEA in January 1987. At the request of Naval Ordnance Station, Louisville (NAVORDSTA, Louisville) metallurgical and fracture mechanics tests were performed by Benet Laboratories to determine service life of the 16"/50 barrel.

Analysis of the Benet tests by NAVORDSTA, Louisville determined that the barrels of turret II U.S.S. *Iowa* would not catastrophically fail, even if the liner were cracked through to the gun barrel (the gun barrel is roughly seven times as thick as the gun liner) (Avg. 2").

Original condemnation criterion were based on monobloc (single piece) gun barrel design. The *Iowa* class gun barrels are of liner/tube construction.

The current condemnation criteria for cracking in gun barrels is stated in the applicable technical manual regarding serviceability of Naval gun barrels as being the existence of any crack equal or greater than 3 inches for monobloc barrels. As a result of the Benet tests, new condemnation criterion were established exclusively for the *Iowa* class built-up 16" barrels. These condemnation criterion address depth of cracks in excess of .25 inches or greater and eliminate references to crack length.

The January 1987 restriction on firing turret II guns was revised in March 1987 to apply only to 2,700 lb. projectiles with full charges D839 and D846. In June 1987, the restriction was further revised to permit the firing of 2,700 lb. projectiles with the D839 full charge.

The Navy continues to monitor bore erosion and gun wear aboard all battleships in accordance with standard policy. When relining of 16"/50 barrels in any battleship is required, liner forgings manufactured from modern gun barrel steel will be used.

Chairman Nunn. Thank you.

Senator Exon.

Senator Exon. Mr. Chairman, thank you very much.

Admiral, I am glad that you pursued at great length what it was that set off the tremendous explosion. It is very clear from your report how you think it happened.

In questioning today you have indicated that past accidents were caused by a burning ember or something like that. But you are convinced that that was not the case in this instance, right?

Admiral Milligan. Absolutely.

Senator Exon. Pursuing that a little bit further, how many seconds previous to this tragedy in the center turret have other guns fired?

Admiral Milligan. The last gun to fire was the right gun of turret I, at least 4 and maybe 8 minutes prior to this accident.

Senator Exon. Then that would have pretty much eliminated. Is there any chance or possibility that had there been a close firing that an ember from an adjacent gun could have come down the barrel of this gun? Is that a possibility?

Admiral MILLIGAN. We looked at that, Mr. Exon, and we found the relative wind from turret I carried the debris from the fire of turret I clear of turret II.

Senator EXON. So, you did check into that proposition?

Admiral MILLIGAN. Yes, sir.

Senator EXON. Now, I have listened very carefully to the testimony, and you have indicated that at one time there was an explosion in the *Mississippi,* I believe, since 1917. How many accidents of this type have there been, regardless of the size of the gun? How many accidents have there been where explosions have taken place as we now know happened in the *Iowa* and as you mentioned in the *Mississippi* several years ago? How many in total have there been?

Admiral MILLIGAN. If you will let me correct the numbers for the record later, there have been on the order of 10 bag ammunition-type accidents on board ship, about half of which have taken place in the handling of the propellant while in the cans. In other words, moving cans of ammunition. Those were ESD events. The balance occurred in the gun rooms.

But all of them, to the best of my knowledge, were caused by flareback in a situation where the gun has already fired and then there is a flareback at the time of the loading of the next round.

Chairman NUNN. That is exactly like we have here.

Senator EXON. You never have had an explosion before the gun was actually fired?

Admiral MILLIGAN. We have had the flarebacks with the ammunition in the tray, but only one, I believe, in a breech. Is that correct, Joe?

Captain MICELI. Yes, sir.

Admiral MILLIGAN. The *Mississippi,* and that was a flareback, or a burning ember.

Senator EXON. So it is, then, the *Mississippi* was the last accident of this type before this one?

Captain MICELI. 1943.

Senator DIXON. The *Mississippi* was 1924.

Captain MICELI. Two of them. One in 1924 and one in 1943. Both in the *Mississippi,* the same turret, different guns.

Senator EXON. In both instances what was the cause of the explosion that was determined?

Captain MICELI. In 1924 it was flareback, and in 1943 it was a foul bore. The investigating officer indicated that it was a foul bore and a hot ember. I have the two reports here, sir, if your staff would like to review them.

Senator EXON. Well, let me finish my questioning by returning to this matter of Hartwig again. Hartwig was not assigned to be the gun captain the day of this tragedy. If he were not to be the gun captain, I assume that he would not have been in the gun turret area, or not?

Admiral MILLIGAN. He was not on any watch bill, so he might have been in the turret, or he might have been in his berthing area, or anywhere.

Senator DIXON. In his what?

Admiral MILLIGAN. In his berthing area, or some other work area.

Senator EXON. In other words, he was not supposed to do duty at this particular time?

Admiral MILLIGAN. He was not on the informal listing of watch station assignments. That was actually 2 or 3 months old and had no date on it, but we determined it was developed around the March timeframe. He was not assigned a watch station on that document.

Senator EXON. Now, if he was not assigned, who would he have to go to to get authority to be assigned, or to be in that particular place? He would have to have gone to his superior officer of some type?

Admiral MILLIGAN. He would have to go to the senior chief, who was the turret captain.

Senator EXON. Did he do that?

Admiral MILLIGAN. The senior chief is one of the deceased in this accident, and so we cannot confirm that.

Senator EXON. There would not have been any paperwork connected with that?

Admiral MILLIGAN. No, sir. Petty Officer Lawrence did the prefire checks in the morning, or the evening before the accident. He was anticipating being the gun captain. There was a shortage of personnel in the center gun room. Under some conditions Petty Officer Hartwig ended up being the gun captain on that day, but everyone involved in that decision process was lost in the accident, or incident.

Senator EXON. You have determined beyond any reasonable doubt in your mind, obviously, that Hartwig was the gun captain because, unless he was the gun captain, he could not have done what you are convinced he did to cause the explosion, is that correct?

Admiral MILLIGAN. Yes, sir. I am convinced, without a doubt, that he was the gun captain on April 19.

Senator EXON. Now, in that room that you showed us a picture of, there was a gun captain and there were, if I remember correctly, two or three other people in that capsule immediately by the breech. How many were there?

Admiral MILLIGAN. There are three people, the gun captain and then the cradle operator is behind him, and the rammerman is across on the left side of the picture, as you looked at it.

Senator EXON. Now, you conclude that Hartwig was the gun captain that day because of the recovery of a portion of his body there. Was his body damaged, in a significantly different way than the other two people in the area?

Admiral MILLIGAN. Without getting into the details of that issue in an open hearing here, I would say that we have forensic proof that Petty Officer Hartwig was the gun captain. The forensic analysis supports the conclusion that he was the gun captain.

Senator EXON. Can you be a little more forthcoming than that? You have concluded he was the gun captain on what basis? I understood that you had concluded that on the basis of the location of his body, the condition of his body and so forth. Is that not correct?

Admiral MILLIGAN. That is true. On the condition of his body, and also on the fact that the other gentleman on that side of the gun room was wearing the sound power phones which were worn by the individual who manned the position of the cradle operator.

Senator EXON. I thank you very much. I have used up my time, Mr. Chairman.

Chairman NUNN. Thank you, Senator Exon. Senator Dixon.

Senator DIXON. Admiral Milligan, if I understand the nature of the conclusions you drew, or your staff and you drew, the Navy's findings are predicated upon basically two things: psychological evidence that Hartwig was disturbed and perhaps suicidal, coupled with physical evidence from your test concluding that remnants of an explosive device were recovered from the gun.

But I would tell you that as to the second, the remnants of an explosive device recovered from the gun, at least at this point in time the FBI lab takes issue with that and makes no such finding.

Second, with respect to the evidence, the psychological evidence, that he may be suicidal and so forth, my information is that in fact the psychologist, the FBI psychologists, were told that they should eliminate the idea of this having been caused by an accident and they were given three alternatives: either the gunnersmate Second Class Hartwig deliberately caused the explosion; in the second alternative, that Truitt planned the incident in order to murder Hartwig; or on the third that Hartwig planned the explosion to kill himself and Truitt, who survived, and that on the basis of those three alternatives given to the FBI psychologists, they found support for alternative one, that Hartwig deliberately caused the explosion.

I would have to suggest that if your conclusions are predicated on those two, what would appear at first to be finite points, that each is seriously flawed when examined in the context of what the FBI did.

Admiral MILLIGAN. Well, my conclusions, or opinions, are predicated on many, many more than the two issues that you mentioned. For instance, on the foreign material, I did not base my conclusion on the explosive device of a timer, or anything like that. I based it on the fact that we had foreign material in the propellant charge. Something was in there that should not have been there.

Senator DIXON. That would be on the dummy shell, may I inquire?

Admiral MILLIGAN. That would be on the inert projectile that we removed from the barrel.

Senator DIXON. What ordinary folks would call the dummy shell?

Admiral MILLIGAN. It was a blank loaded and plugged shell.

Senator DIXON. Okay. For the purposes of our discussion, if you do not mind my calling it a dummy shell, that is where you found this so-called material and iron wire, some calcium and other things, that caused you to draw that conclusion. Is that right?

Admiral MILLIGAN. In the rotating band.

Senator DIXON. How long have those shells generally been in existence?

Admiral MILLIGAN. That shell is probably a large number of years old. I do not know when it was manufactured.

Senator DIXON. Ten years old?

Admiral MILLIGAN. Possibly.

Senator DIXON. And had been stored where, generally, on the ship would you say?

Admiral MILLIGAN. In the magazine, right in the turret.

Senator DIXON. Could it have been taken from one ship to another?

Admiral MILLIGAN. Probably in the history of that shell, it may have been moved.

Senator DIXON. Did you ever hear about the rule of law that when you look at evidence like that you have to exclude the possibility of other possibilities of contamination? I mean, here is a shell, 10 years old, that has been moved all over the place and you are concluding that Hartwig put something in the breech, when it is 10 years old and it has been all over the place?

Admiral MILLIGAN. My conclusion says something was put in the propellant charge, not on the shell. It got into the shell, into the rotating band of the shell.

Senator DIXON. But you drew the conclusion from finding it on the shell?

Admiral MILLIGAN. Absolutely.

Senator DIXON. Absolutely. A shell 10 years old that has been all over the place.

Admiral MILLIGAN. With foreign debris burned and embedded in the soft copper ring.

Senator DIXON. But the question is, how did it get on there, do you not see? Let me ask you this: you have made a lot out of the fact that the rammer was, how many inches did you say in? 21?

Admiral MILLIGAN. It was 42 inches into the breech, 21 past where it should have been.

Senator DIXON. Now, Hartwig did not control that rammer.

Admiral MILLIGAN. He controlled the rammer through the hand signals to the rammerman.

Senator DIXON. I know that, but he did not control the rammer. Somebody else controlled the rammer.

Admiral MILLIGAN. My position is, he controlled the loading of that gun and he controls the rammer by telling the rammer——

Senator DIXON. I understand he gives hand signals, but somebody else put that rammer in there 21 inches too far. Hartwig did not touch the rammer.

Admiral MILLIGAN. Hartwig is the one who is signaling and telling that man what to do, and that is the assumption you have to make. He was the gun captain. He controlled the loading of that gun.

Senator DIXON. You draw all of your conclusions on the circumstantial things that you relate to us in a circumstance, may I say as a lay person, with all due respect to you, Admiral, where the Navy is using bags containing highly explosive material in a room where by your own rules you tell people to not even bring in a cigarette lighter, and by your own testimony practically everybody in there had cigarette lighters.

You predicate this case of circumstantial evidence in the most volatile situation probably known to mankind, a fabricated bag full of explosives in a room where everybody had cigarette lighters and everything else. I think it is a conclusion, on the basis of what has occurred, remarkable.

I wonder—you have had 10 accidents of this kind with these ammo bags. I cannot think of anything more explosive than those ammo bags, or dangerous.

Admiral MILLIGAN. We have had no accidents of this kind with these ammo bags.

Senator DIXON. May I say that your friend Captain Miceli, our distinguished naval captain, has indicated that on the *Mississippi* in, I think it was 1943, there was a foul bore, a dirty bore with a spark in it that cause the igniting that transpired.

Admiral MILLIGAN. A foul bore is a bore where the gun has been fired, and it did not fire. That is a foul bore. It is not a dirty bore. It is a loaded gun where the primer has fired.

Senator DIXON. My time has expired.

Admiral MILLIGAN. I have to say that my investigation does not only look at the things that you bring up. It looks at many, many issues, and you have to have all those facts under consideration to come to the conclusion, sir.

Chairman NUNN. Senator Warner.

Senator WARNER. Mr. Chairman, I think it is important just to follow on with the question there. Since the *Iowa* class has been brought out, how many firings have there been of the 16-inch gun?

Admiral MILLIGAN. You are talking about the current reactivation of the ships?

Senator WARNER. That is correct.

Admiral MILLIGAN. Oh, I guess thousands.

Senator WARNER. I have heard 12,000 to 14,000.

Admiral MILLIGAN. That sounds reasonable.

Senator WARNER. Without incident?

Admiral MILLIGAN. Yes, sir.

Senator WARNER. The same basic turret was utilized in World War II, and again, the Senator referred to that tragedy aboard that one battleship, but there were literally hundreds of thousands of firings during that period without incident, am I not correct on that?

Admiral MILLIGAN. That is correct, sir.

Senator WARNER. Now, Admiral, have you had an opportunity this morning, and the Captain and Mr. Powers, to provide this committee with all of the pertinent facts that you feel we should take into consideration?

In other words, we have questioned you, but during the course of the questioning, do you feel that there is another aspect that you have not presented in either direct testimony or in the submissions, that you would now like to provide this committee?

I am giving you an opportunity at this time to provide such additional testimony as you feel might be pertinent—my invitation is to all the witnesses.

Admiral MILLIGAN. Well, I would like to make a few comments, Senator Warner. I appreciate the opportunity to do so.

Really, to make sure the record is straight, we have had a significant discussion with regard to the FBI equivocal death analysis, and I need to make it understood that my understanding of equivocal is, it refers to the manner of death in unattended or suspicious circumstances, not to the strength of the psychologist's report, with regard to their opinion.

Chairman NUNN. In other words equivocal modifies death and not analysis, is that right?

Admiral MILLIGAN. Not their opinion. It is more to the unattended or suspicious nature of the situation, not to the analysis of the psychologists that conducted the review.

I also have talked many, many times today with regard to the position of the rammer in the center gun on April 19, and the fact that the rammer is 42 inches into the breech is really an unexplained issue.

The rammer was where it should not have been, and it is a very significant part of this investigation and it is very conclusive evidence that that rammer was, in fact, 42 inches into the breech. That is a very important issue, and I would ask Mr. Powers if he has any comments?

Mr. POWERS. I have no comments.

Captain MICELI. I would like to make one.

When the Admiral and I had to make a recommendation that would allow the CNO to lift the moratorium on the battleships, I did not make my recommendation with regard to the safety of the propellant until August 7. At that point in time we not only looked at the affected lot, but we also examined and critically analyzed the worldwide inventory of 16-inch propellant. We conducted sufficient sampling, a lot of sampling, to be able to state that we had a 99 percent confidence level that 99.99 percent of the inventory was safe.

Now why can I not say 100 percent? I would have to test the total inventory.

Thank you, sir.

Senator WARNER. Mr. Chairman, I wish to compliment you and other members of the committee. I asked for this hearing, and I think we have had a fair and open first session.

The chairman and I have discussed subsequent meetings on this matter. Of course, that is a matter for the Chair to announce at an appropriate time.

I think that we are, in the eyes of the American people, off to what I would call a fair and objective search for such facts as might bear on this case and have provided the Navy an opportunity to tell us their story. Now we will provide an opportunity for others to come in and give their perspective on this case.

This is one that is not only important to the families who suffered these losses, but equally, if not more important to the thousands and thousands of sailors still out there operating these ships and aircraft all over the world today. They have to understand if there is a problem that they will be treated in a fair and objective manner as we are endeavoring to do.

We thank you.

Chairman NUNN. Thank you, Senator Warner. We will be hearing from the captain of the ship sometime in December, and, depending upon when the General Accounting Office completes their inquiry, we will hear from them also and perhaps from the FBI. So we do plan further hearings.

Admiral, did you make any kind of recommendation regarding the Navy taking disciplinary action against any of the people on the ship from the captain right on down?

Admiral MILLIGAN. Yes, sir. My report includes a number of recommendations with regard to taking principals to nonjudicial punishment or mast and also with regard to relieving them from their duty, sir.

Chairman NUNN. Have those all been acted on by the CNO?

Admiral MILLIGAN. There were a couple of modifications in the endorsement process. Subsequent to that, all of those mast cases have been held, and the flag officer holding the mast has made his decision.

Chairman NUNN. Can your recommendations there be made public?

Admiral MILLIGAN. Yes, sir.

Chairman NUNN. Have they been made public?

Admiral MILLIGAN. The report has been made public. There are some redactions, but the recommendations, I think, are still available in the redacted report.

Chairman NUNN. Thank you. Senator Glenn.

Senator GLENN. Thank you, Mr. Chairman.

At what temperature does the powder normally ignite? Do you know, Captain?

Captain MICELI. Yes, sir. The propellant at approximately 450 F, and the black powder at approximately 900 F.

Senator GLENN. Does that change as the powder degrades over a period of time? Do you run checks on it and say it is still good powder, but does the ignition requirement change as the powder degrades over a lengthy period?

Captain MICELI. The test that we ran with regard to stabilizer, remaining diphenylamine in the propellant, indicates that in a worldwide inventory the ignition temperatures would be about as I indicated.

Senator GLENN. So as the powder degrades or as the propellant degrades, the ignition temperature requirement does not substantially change? Is that correct?

Captain MICELI. I am not aware of that sir. We did not find any increased sensitivity either in the black powder or in the propellant with regard to——

Senator GLENN. It lights at about 450?

Captain MICELI. The propellant does, and the black powder is about 900.

Senator GLENN. About 900?

Captain MICELI. Yes, sir.

Senator GLENN. In these checks that you ran on different things, friction being one, electrostatic discharge, if you overram what would the pressure get up to? As I understand the data, there is about 2,200 pounds of pressure on the bags. Is that correct?

Captain MICELI. 2,200 pounds of force, not psi.

Senator GLENN. OK, 2,200 pounds of force. What would have been the temperature rise on the bags just from that force?

Captain MICELI. I do not think there would be any.

Senator GLENN. From an overram, the pressure would not cause the temperature to go up?

Captain MICELI. I do not think so, sir. If it does, I believe it would be negligible.

Senator Glenn. Because your volume is not going down? I think your volume would be going down in that case. This is just a law of physics. PBT equals PBT, as I recall.

Captain Miceli. Yes, sir. I do not think that is a significant issue with regard to the overram.

Senator Glenn. Did you check that?

Admiral Milligan. We conducted the overram test 100 times.

Senator Glenn. What temperature rise did you get, then?

Admiral Milligan. We did not measure the temperature, to my knowledge.

Captain Miceli. I do not remember that specifically. I would like to get back to you with the specifics on that.

Senator Glenn. I would like to know, because there has to be some temperature rise there. I just cannot imagine there would not be.

Captain Miceli. Let me check, and I will get back to you on that right away.

Senator Glenn. All right. If you would, I would appreciate it.

[The information referred to follows:]

TEMPERATURE INCREASE DURING RAMMING

Specific tests were done to measure whether any temperature increase occurred in any portion of a bag charge during ramming into the gun. Thermocouples were used to measure the temperatures at several locations in the propellant bag, at two locations in the black powder ignition pad, and at two locations between the silk bag and the polyurethane foam liner. A total of 8 rams were done, with 5 being at the bag charge ramming speed of 1.5 feet per second and with 3 being done at an intermediate speed of 5–6 feet per second. The bag charges were rammed until they were stopped by the projectile, and the pressure was held on the charges for several seconds. The maximum temperature rise measured in any of these tests was 3 degrees F, which is considered negligible.

Senator Glenn. I was wondering, too, did you test any combinations together? I was wondering whether if you had a pressure rise because of this, did you then at the same time put in any electrostatic discharge? Did you put in any friction heat? Were there any combinations run?

I know you cannot carry this out to ridiculous extremes perhaps, but were any combinations run where things could have acted together? This is not an either/or type situation. You had a lot of dynamics working on that gun all at one time.

Captain Miceli. We looked at all the different possible combinations that we could think of.

Senator Glenn. Such as you ran the electrostatic discharge or friction and the pressure all at the same time?

Captain Miceli. We ran the propellant test on the propellant grains. We ran the propellant test on the ground-up propellant grains. We ran propellant tests with anywhere from 450 psi of pressure to 20,000——

Senator Glenn. That is not my question. My question is did you run all of these combinations on the dynamics that were occurring on that gun at that time? Where you had some friction, you measured friction? You had ESD, you measured ESD? You had pressure rise because of the rammer going in too far. All these things were occurring, but there was no test end run on combinations thereof; is that correct?

Captain Miceli. Yes, sir, there was. I will be happy to provide the specifics to you.

Senator Glenn. I would like to have that, because I think it is very important.

Captain Miceli. We ran field tests, the actual conditions, the environment that existed in the gun with the overram, on propellant, on black powder, on broken pellets, on crushed black powder, and we also ran the laboratory test to stress the condition to determine what kind of a possible ignition could occur.

Senator Glenn. Well, can we say with any absolute certainty that a combination of these things would not have combined to get this up to ignition temperature?

Captain Miceli. I ran combinations with ether, pressure, ESD, hero, friction, compression, and I would like to share all of those with your staff, sir.

[The information referred to follows:]

Tests Combining Possible Causes

A number of tests were run which combined various possible causes as identified in the cause and effect analysis. A summary of these is provided below.

1. A new test fixture was devised to simulate the effects of the ramming process on loose propellant and black powder. The test was designed to simulate loose propellant grains, ground up propellant grains, or black powder either on the cradle or in the chamber during the ramming cycle. This was primarily a friction test, but other possible environments were added as well. All tests were done with propellant and black powder from bag charges of the same lot involved in the incident offloaded from the *Iowa.*

a. Both the propellant and the black powder were tested with (1) silk bag material and (2) polyurethane wear reducing liner material, both soaked in ether, as one of the frictional surfaces (the other being steel).

b. A number of "contaminants," including sand, rust, iron filings, glass beads, and Break Free CLP were used to coat the steel surface. Whole propellant grains, ground repellant, black powder, and ground propellant and black powder mixed together were tested with these contaminants. Three combinations of frictional surfaces were used: steel on steel, silk bag material on steel, and polyurethane wear reducing liner material on steel. The silk and polyurethane materials were also tested soaked in ether.

2. Full scale ramming tests were done at both the projectile ramming speed (14 feet per second) and at the bag charge ramming speed (1.5 feet per second). These tests subjected the propellant and black powder to a combination of the following environments: friction, impact, compression, ether (the ether remaining in the air inside each bag charge after removal from the powder tank), and the electrostatic charge built up on each bag charge during handling and ramming.

3. Electrostatic discharge tests were done on full bag charges in a sealed test chamber immediately after removal of the charges from the powder tanks in order to preserve the ether atmosphere inside the bags.

No reactions occurred in any of these tests.

Senator Glenn. All right.

Senator Nunn asked about the delay fusing on this thing, and I do not want to get into experimental delay fusing but I want to clear that up. I do not believe that was being used at this time. Was this a dummy load?

Admiral Milligan. It was a blank, loaded and plugged inert projectile.

Senator Glenn. So this could not have been a factor in this thing at all?

Admiral Milligan. That is correct.

Senator GLENN. One other thing. When you are gunlaying, when you are on target, the gun is stabilized no matter what the ship is doing rolling around under it; right?

Admiral MILLIGAN. That is correct.

Senator GLENN. Is that an electrical circuit, or is that a hydraulic circuit?

Admiral MILLIGAN. That would be electrical. It is trained and elevated with electrical motors.

Senator GLENN. Once it is trained and laying on target, then at that point that is all electrical circuitry that keeps it trained no matter what the roll of the ship is underneath it?

Admiral MILLIGAN. Yes, sir. It does not roll very much, sir.

Senator GLENN. But it rolls some, enough to throw you off target. If you are firing at something 20 miles away, it does not take but a millimeter or two to throw you clear off target.

Admiral MILLIGAN. The elevation and train are electrically driven.

Senator GLENN. Was that activated so we know there was no electrical circuitry that got into this from the gunlaying? Was that stabilization system on during this firing?

Admiral MILLIGAN. Yes, sir. The gun was in full operation.

Senator GLENN. Was that a factor, and did you look at that as to whether that particular turret might have had antiextraneous circuits because of the gunlaying?

Admiral MILLIGAN. We looked for any possibility of an electrical short that might have caused this accident and could find nothing. Now the gun was on a target——

Senator GLENN. Including the stabilization? Because when you run it on shore at Dahlgren, you would not have gun stabilization on.

Admiral MILLIGAN. Yes, sir. That is true. For this particular gun it was in a load position, so it was not under the stabilization at that time. Once a gun is loaded and put back into automatic, it comes up to the target elevation and then is stabilized at that elevation.

Senator GLENN. Just one other comment, and then my time is up.

There were so many people on this thing in the chain of command, the captain, executive officer, weapons officer, gunnery officer, not knowing that this was a nonstandard loading and that there were unqualified people doing a live firing exercise.

Now Admiral, you are not CNO yet, I know. But because of the state of readiness at that time aboard the *Iowa,* I hope we can get some assurance from you that this is not representative of the readiness of other ships in the fleet.

When you had the *New Jersey,* was this considered normal operation as to what the readiness was on the *Iowa* and the preparation of the officers and the crew? Was this normal operations?

Admiral MILLIGAN. No, sir. The condition on the *New Jersey,* I certainly would hope, was not this way, and as best I recall it was not.

Senator GLENN. How do we know this is not going on throughout the whole fleet right now? That is my major concern.

Admiral MILLIGAN. We have continuous inspection programs, and we are doing everything we can to maintain our readiness. Some of these programs are difficult, but there is no question in my mind that in the weapons department—and I leave it only with the weapons department on board the *Iowa*—there were some major problems with regard to the administration of that department.

I think it has to be known. Those were laid out very clearly right in the open in this report. Everything that I did in this investigation is right out in the open. We made recommendations with regard to those problems. The Chief of Naval Operations had directed action to make sure that they are rectified as a matter of urgency. They are not acceptable, sir.

Chairman NUNN. Thank you, Senator Glenn.

I believe Senator Levin is next.

Senator LEVIN. Thank you, Mr. Chairman.

Back to this difference between the electronic and the chemical timer issue, Admiral. One of your findings, number 230F, I believe, said that all three rotating bands had been examined under a scanning electron microscope, an SEM, and then it says the overall SEM spectra shows a close comparison between the *Iowa* ring and the ring from the test firing employing a timer control explosive device.

Is that an electronic explosive device? Is a timer control explosive device an electronic explosive device?

Admiral MILLIGAN. Yes, sir.

Senator LEVIN. At the time you wrote these findings, it was your belief based upon some kind of a microscopic examination that the foreign material that you found there looked like it could have come from an electronic timer; is that correct?

Admiral MILLIGAN. At the time I signed my report, Senator Levin, that was the closest match we saw in our analysis; but I have to restate the basis of my report is on the fact that foreign material was found in the propellant charge, not the specific type of initiator.

Senator LEVIN. Except there was a specific finding of fact?

Admiral MILLIGAN. There was a finding of fact. It is an opinion, I believe—is it a finding of fact?

Senator LEVIN. I do not know.

Admiral MILLIGAN. If it is 220-something, it is a finding of fact. The best match on that was with the electronic timer or the residue from a test shot using an electronic timer.

Senator LEVIN. It is that finding which the FBI report precluded; is that correct?

Admiral MILLIGAN. The FBI analysis of the residue could not find an electronic timer device, nor could we in our further analysis.

Senator LEVIN. So the FBI finding was inconsistent with your finding 230F?

Admiral MILLIGAN. At that point in time. But right now our finding is consistent with the FBI, that we did not have an electronic timer.

Senator LEVIN. My question is, was the FBI finding inconsistent with your finding 230F?

Admiral MILLIGAN. It was inconclusive, that is correct.

Senator LEVIN. That is not my question. Did I say inconclusive? I misspoke. I thought I said inconsistent.

Admiral MILLIGAN. Their finding was inconclusive. Ours was that we had the residue there, so they were inconsistent. There is no question.

Senator LEVIN. Well, then, let me ask my question again. Was the FBI finding inconsistent with your finding 230F?

Admiral MILLIGAN. I would have to say yes.

Senator LEVIN. When I asked you before, I think on my last round, whether there were any inconsistencies between the FBI findings and yours, you said no, but now I think you are agreeing that at least in that one area, that the FBI findings are inconsistent with your finding, 230F.

Admiral MILLIGAN. The FBI did not find any fingerprints of a chemical—excuse me—of a timer device, and this finding of fact, in my report, says that the residue in the *Iowa* band most closely matches with the residue from a test firing band that used a timer device as the source of ignition.

That is the issue there.

Senator LEVIN. I am not sure I understand the difficulty here in saying that, yes, the FBI finding is inconsistent with your finding, 230F. Why is that a complicated thing for you to acknowledge?

Admiral MILLIGAN. I do not have any problem acknowledging that. They did not find it. And, at this point in time, we did not either.

So, I guess in that, we are consistent. But not at the time I signed the report. I signed the report on the basis that we had foreign material, not that we had a timer device.

Senator LEVIN. I am not sure how you are answering my question. I am no longer sure. And I will ask it again.

Admiral MILLIGAN. Okay, sir.

Senator LEVIN. Was the FBI finding inconsistent with your finding 230F?

Admiral MILLIGAN. Yes.

Senator LEVIN. What troubles me, I must tell you, is not so much your conclusion. I think people can differ on conclusions, and you had an obligation to reach the best conclusion you could. You do your duty the way you see it, and that is what you have got to do, that is what you take an oath to do, and I think you have done a good job of carrying out your oath. What bothers me is the certainty of your conclusion that you do not acknowledge that there are some factors which raise some doubts.

Now, you can resolve those doubts the way you have, and I understand that. Whether I agree with it or not is not the point, but you can in good conscience, I believe, reach the conclusion you have and resolve the doubts in the way you have. But what troubles me is that you do not acknowledge the existence of any doubt. And even in a criminal trial a jury can convict, although there is a doubt, not if there is a reasonable doubt, but a doubt.

There are factors pointing in different directions here which trouble me, including the fact that he was not assigned to be there that day. That is a troubling fact for me.

Admiral **Milligan**. He was there and we have conclusive evidence he was there.

Senator **Levin**. A premeditated, purposeful act of suicide when you were not supposed to be there is a little difficult for me to accept. It raises a doubt in my mind. That is all I am saying. I might resolve the doubt the same way you resolve the doubt.

Admiral **Milligan**. I understand.

Senator **Levin**. But you do not acknowledge any information at all that raises a doubt, even though you have resolved your doubts the way you have. What troubles me about your conclusion is that it is so absolute and unacknowledging of any factual material pointing in a different direction.

If you had said, look, I have got 250 facts, 220 of them point this way, and I have got 10 of them, or whatever, pointing the other way, I resolved it that way. If you had done that, I would feel a lot more comfortable. But the inability to acknowledge any doubt is what troubles me.

Also, I do not know why the question about the inconsistency between your finding and the FBI finding cannot just simply be acknowledged. It is not something which is not explainable in the way you have tried to explain it, but there is an inconsistency.

So you went back and looked and sent out this material to a different lab, and they came back with a different conclusion, which still supports your ultimate conclusion. That seems to me to be the way to answer that question.

I am just expressing my own feeling. I think you have carried out your duty according to your best conscience, and that is what you are supposed to do. And it is a tough job, and I think all of us ought to, by the way, appreciate that you have got a very difficult job and you do not relish the finding that you have made. It comes through very clearly in your testimony and otherwise. And I think we have to acknowledge you have a very, very difficult job.

Those are my difficulties with your conclusions. Thank you.

Chairman **Nunn**. Did you want to respond, Admiral?

Admiral **Milligan**. Well, I would say that this was very difficult, but I feel a very thorough, and maybe unprecedented investigation, with regard to the depth that we went into all aspects of the investigation. And I would tell the committee, Mr. Chairman, that the conclusion or the opinions that I come to were very painful to eventually settle on. It was not an easy job whatsoever. I knew what my task was, and that was, to the best of my ability, to find out what caused this accident, as I said earlier, so that it would never happen again. And I believe that is what we did.

And every fact, every bit of information that was available to me is in this report. And when I put it all together, I made the only opinion that I could. And as painful as that was, believe me, I have the deepest sympathy with the family of Petty Officer Hartwig for what this has come down to.

I wish it could have been a different way.

Chairman **Nunn**. Thank you.

Senator Dixon, do you have any other questions?

Senator **Dixon**. Admiral, getting back to that rammer, my understanding, as a lay person, of your testimony, is that the rammer was 21 inches beyond the position it should have been in at the time. Is that a layman's correct interpretation of your testimony?

Admiral MILLIGAN. That is correct.

Senator DIXON. Now, I am advised that the rammer had a considerably bad performance record in the immediate past; that, in fact, it accelerated sometimes and sometimes it stuck, and that there was substantial mechanical difficulty in the past with that rammer. Is that information available to you?

Admiral MILLIGAN. Our inspection of the turret and all of the maintenance records associated with turret II show no materiel problems in that turret.

Senator DIXON. But did you have information from other members of that crew who had operated that rammer in the past, that they had difficulty with that rammer?

Admiral MILLIGAN. None that I recall, but I would have to go back and review all of that, it has been a long time.

Senator DIXON. I wish you would reexamine your record. My information is that there are personnel who suggested that it accelerated sometimes, sometimes it stuck, and that it had technical difficulties.

Admiral MILLIGAN. I guess I would only add to my comments at this point, I will go back and look at the testimony. But we removed that entire system from the ship after the accident. We then reconstructed the entire rammer system over at the Norfolk Naval Shipyard, and that system worked absolutely perfectly. The only damage to it was that the chain and the rammer head were missing.

Senator DIXON. Well, I reference the precise rammer involved in the incident.

Admiral MILLIGAN. That is the rammer I am talking about.

Senator DIXON. Yes. Okay.

I would like for you to look into that. Our information is that that rammer had been one that did not function well. What would be the significance of that?

Chairman NUNN. Senator Dixon, there is some information, I believe, that there was a rammer in another turret that did not function, that they had some problem with.

Senator DIXON. But then it is not uncommon for a rammer to not function well?

Admiral MILLIGAN. As I just mentioned—no, it is uncommon, because they are a very reliable system.

Senator DIXON. Can rammers accelerate too much and sometimes jam? Do they do that?

Admiral MILLIGAN. I know of no history of that happening.

Senator DIXON. But it does happen sometimes?

Admiral MILLIGAN. I know of no history of it happening.

Senator DIXON. What was the significance of that rammer being 21 inches too far in, to you?

Admiral MILLIGAN. It does a number of things. One of them is it pushes the five bags up against the base of the projectile, so that is a very significant issue.

If the rammer is not that far in and you have a problem, say, it is right near the face of the breech and you have a problem, you can in fact extract the cradle, it will send the rammer up into the overhead of the gun room, but you could extract the cradle and shut the breech real fast if you had a problem. With the rammer 42 inches in the breech you could never do that.

So it really had the system locked into where it was at the time of the explosion.

Senator DIXON. And I have information that sometimes they put that pad—forgive me for using lay terminology—between bags four and five; that it is not always put between one and two. What is the significance of that distinction?

Admiral MILLIGAN. There is testimony that the gunnersmates who—the gun captains do not always put the bag in between bags one and two. I can just tell you that the technical manual and a competent gunnersmate—the technical manual says and a competent gunnersmate would put it in the right place. And we have every reason to believe that Petty Officer Hartwig was a competent gunnersmate.

Senator DIXON. Well, on the basis of everything I have heard from you so far, I come to these conclusions. By your own statement here, this turret at least was not functioning as well and operated as well as you thought you did on the *New Jersey*. So there were troubles with the operation.

We have all the statements about missing personnel, inexperienced personnel and unqualified personnel there. We have highly explosive material, powder in fabric bags. We have cigarette lighters in there. We have all of these conditions that could have contributed to any multitude of different accidents or acts of God of some sort or another that could cause this same terrible tragedy.

And notwithstanding every single, solitary one of those things, and the flaws in the factual train concerning Hartwig himself that has been gathered by your staff and others, you still come to the conclusion that it has to be Mr. Hartwig.

Admiral MILLIGAN. Well, everything you mentioned there are all issues that we pursued, investigated very thoroughly. And when you take those and the hundreds of other issues that this investigation got into and resolved, you can only come to the conclusion that I came to in my report.

Senator DIXON. Then I will ask you finally this question. From the perception of the American public that always wants to know the truth about all of these incidents, and with absolutely no reflection upon you as a man of integrity, or anybody assigned to this very difficult task with you, would you not concede that for the service to examine its own problems in situations of this type, it always makes the ultimate result somewhat critically received by many in the public at large who wonder how the conclusions can be drawn?

What I am trying to arrive at from you is whether it is not a fact that some other independent, separate agency ought not to make these investigations and draw these conclusions?

Admiral MILLIGAN. Mr. Dixon, these are our people, these are fellow service members of mine who we lost in that accident. I do not know who could be more interested in finding the actual cause of this accident than the Navy itself. It is our problem. We are very safety conscious. And as I know I have said in the earlier part of this hearing, our only goal is to find out what happened in this case.

Senator DIXON. But you would not concede that some might extrapolate from that, that it is in the interest of the Navy to find that it was purposely done with someone, so people would not draw the conclusions that these dangerous accidents can occur in the future and that other things ought to be done, maybe with the fabric, maybe with the explosives, maybe with the rammer, maybe with the staff, maybe with a lot of other things that I can think of, all of which occur to the mind of any lay person that listens to this?

Do you not think that is a possibility?

Admiral MILLIGAN. I would hope that the general public would look at the Navy as being the one body who would be most concerned about this problem and would do the most thorough job in the investigation. And, sir, that is what I feel we did.

Senator DIXON. I thank the chair.

Chairman NUNN. Let me just ask one follow-up question on that, Admiral. What kind of resources would a group of people have to have to conduct the kind of investigation that you have gone through here?

Admiral MILLIGAN. Well, Mr. Chairman, your question is very apropos, because we in the Navy really are the ones who have the best resources to do the testing that we did to support this investigation. I do not know who else has those kinds of resources, such as our ordnance laboratories and such as our metallurgical capability.

Chairman NUNN. Does the FBI have all the capabilities that you have?

Admiral MILLIGAN. Well, certainly not to do all the testing that we did with regard to the propellant.

Chairman NUNN. Even if there was another agency in charge, would you not, indeed, with your equipment and your personnel and your know-how, would you not have to supply most of the expertise as well as most of the equipment?

Admiral MILLIGAN. I would think they would have to come back to us for the majority of the effort, yes, sir.

Senator WARNER. Mr. Chairman—I think the Chief of Naval Operations, based on your findings, has authorized the battleship to go back to live firing. Am I not correct?

Admiral MILLIGAN. That is correct, sir.

Senator WARNER. And that decision would not have been made were it not predicated on everything that could have been done—has been done in this particular case. And you have concluded that these turrets are safe to operate?

Admiral MILLIGAN. Yes, sir, that is the conclusion of the report, and I am very convinced of it.

Chairman NUNN. Admiral, we thank you. Captain, we thank you, and Mr. Powers, we thank you. We may call you back at some point, but at this point in time you have been very patient and we thank you for being here. We appreciate you undertaking a tough job. We know it is not an easy job; it is very difficult.

Whether we may agree with every single one of your findings and every one of your opinions, I do not know whether anybody would do that, but I do agree, Admiral, with your last statement. I think the Navy, more than any other group of people, has a vital stake and a personal interest and a dedicated commitment not to let this happen again if you can possibly prevent it. And the way you avoid that is to find out what happened here. So, I would certainly, in my opinion, agree with you on that point.

Do you have any other comments before we close?

Admiral MILLIGAN. Well, thank you, Mr. Chairman. I appreciate the opportunity to appear before your committee with my cohorts here, and we look forward to your committee's efforts and will support it in every way possible as you look at our efforts.

Chairman NUNN. Captain.

Captain MICELI. No, sir.

Thank you, Mr. Chairman.

Chairman NUNN. Thank you.

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR ALAN DIXON

FRICTION THEORY

Senator DIXON. The Navy's technical investigative team in a May 25 report stated that they thought friction had caused the explosion in the gun turret. Why was this theory rejected?

Captain MICELI. The May 25 report ended with the following statement: "While friction is now considered the most likely cause of the initiation, this and other potential causes including unstable propellant are still being thoroughly investigated, by experiment and simulation when possible. All significant test results will be reported as they become available."

When the May 25, 1989 report was written, not nearly all of the testing had been completed, and the investigating team was in the process of identifying mechanisms which might have caused the event. After all of the tests had been completed, the results showed that neither the propellant nor the black powder could be ignited by friction under the conditions which could be achieved in the turret. As a result, friction was eliminated as a probable cause of the incident.

BREECH EXPLOSION ON U.S.S. "MISSISSIPPI" IN 1924

Senator DIXON. I understand that there was a similar explosion in 1924 on the battleship *Mississippi* and that the Navy's findings back then indicated that friction caused this open breech explosion. Yet now the Navy says that explanation was in error. What facts subsequently developed by the Navy led to this change in conclusions?

Captain MICELI. The Court of Inquiry into the 1924 accident on the *Mississippi* concluded that the cause was a flareback of combustible gases or a foul bore, which ignited the bag charges during the loading process. The ship was steaming into and firing into a strong wind. The right gun of turret 2 had trouble with its gas ejection air system just prior to the accident. The actual event was a fire, not an explosion as on the *Iowa*.

There was a second accident on the *Mississippi*, which occurred in 1943. The Court of Inquiry into the accident concluded that the cause was a foul bore. As in 1924, the event was a fire, not an explosion as on the *Iowa*. In its review of the report of the Court of Inquiry, the Navy's Bureau of Ordnance gave an opinion that the accident "probably resulted either from a foul bore or from friction, etc., of the powder bags against the moving rammer. To study this latter hypothesis, mixtures of black powder and smokeless powder were ignited by friction. But only negative, although not conclusive, results were had from elaborate and extensive tests with an actual rammer." The Bureau then endorsed the report of Court of Inquiry.

At no time in 1924 or 1943 did the Navy conclude that either accident had been caused by friction. The Bureau of Ordnance did testing in 1943 to evaluate the possibility of a friction event but did not find any supporting evidence. There was no change in the conclusions of the Navy as to the cause of either accident at any time.

DUPLICATION OF "IOWA" EXPLOSION CONDITIONS

Senator DIXON. Has the Navy been able to duplicate the conditions on the *Iowa* in the gun turret using the supposed chemicals found by the Navy labs without external power sources being used?

Captain MICELI. Yes, the Navy has been able to duplicate the *Iowa* event using the chemical device described in our final report. In both open breech burning tests where the chemical device was used to initiate the explosion, no external power sources were used. The chemical device was inserted into the train of bag charges, and the reaction began when the device was crushed by the ramming action, allowing the two chemicals to mix together.

MOVEMENT OF PROJECTILE ON "IOWA"

Senator DIXON. I understand that in a test done on May 7, five bags were ignited near the projectile and no movement of the projectile was noted. In a test done on May 16 five bags were ignited, and the projectile moved forward 269 inches. In the actual event on the *Iowa*, the projectile moved forward 155 inches. Why the variance in these test results?

Captain MICELI. The test on May 7 was done with an extra ignition pad sewn to the front of the first bag charge; the gun barrel used for the test was 93 percent worn, not 20 percent worn as was the *Iowa* barrel. It was this ignition pad, which was between the first bag charge and the base of the projectile, which was ignited by the squib. As a result, the ignition event and flame spreading would be backward toward the open end of the gun chamber, tending to push the bag charges out of the gun. This would result in a lower pressure on the base of the projectile and reduced projectile movement. There was no test conducted on May 16; there was a test conducted on May 12 in which the final position of the projectile was 269 inches, translating into a total projectile movement of 182.75 inches (again, the 93 percent worn barrel was used). In this particular test, ignition was done with a soldering iron in the propellant at the front of the bag closest to the projectile. Without the black powder ignition pad to provide quick flame spreading, the ignition would be very like igniting the ignition pad between bags 1 and 2. This accounts for the large projectile movement. In the actual event on the *Iowa*, the projectile movement was 44 inches; the final position of the projectile was 155 inches.

As to why there are variations in the projectile movement measured from shot to shot with the same ignition location, the ballistic characteristics of an event such as this are inherently variable. The propelling charges are designed to be ignited in a closed chamber with the ignition source (the output of the MK 15 PRIMER) impinging perpendicularly on the rearmost ignition pad. With the breech down and the chamber open to the atmosphere, the burning characteristics of the mass discrete propellant grains in the bag charges, which are designed to burn anaerobically (without external oxygen) in a closed chamber, will necessarily be variable. The ignition portion of the event would also be expected to be variable. Whether using a MK 15 primer or a squib or some other means, the output of the igniter in these tests would not be impinging on the ignition pad in the designed mode. Combining this change with the open chamber and the uncertainty as to the exact orientation of the ignition source after ramming into the gun, the ignition portion of each event would be expected to be somewhat variable. Thus, it was not expected that a test would necessarily result in exactly 44 inches of projectile travel even if the ignition location were exactly right. Obtaining the right magnitude or projectile travel combined with the proper characteristics of the event was the best that could reasonably be expected.

RESULTS OF NAVY TESTS SIMILAR TO ACTUAL EXPLOSION

Senator DIXON. Did any of the tests by the Navy or anyone else ever obtain a similar result of the actual event (close to 155 inches of forward movement of the projectile, buckling of beams, destruction of the rammer head and chain)?

Captain MICELI. The average of the 3 tests done in a 20 percent worn barrel (the same wear characteristics as the actual barrel on the *Iowa*) with ignition between the two bag charges closest to the projectile was projectile movement of 44 inches (final projectile position of 155 inches), matching that actually measured in the *Iowa* event. These tests also provided a violent reaction judged sufficient to cause the damage observed in the *Iowa* turret. The Navy concludes that the event has been replicated.

NEWS LEAKS

Senator DIXON. As I said in my statement, I feel that there were unconscionable news leaks by investigators for the Navy. To your knowledge, what is the Navy doing to find and punish those people responsible for these leaks?

Admiral MILLIGAN. The Navy concurs that the news leaks that occurred during this investigation were unconscionable. We abhor the leaks as counter-productive to this investigative process and view them as a disservice to the Navy as well as the families of both deceased and surviving *Iowa* crew members. Given the enormous scale of effort and scope of the Navy's investigation into the *Iowa* incident, however, it was determined that a formal inquiry into the leak issue would be an enormous undertaking with little possibility of success. The following factors were considered and are germane: The *Iowa* investigation resulted in interviews of over 400 people. Thousands of documents were retrieved and reviewed. Civilian and military personnel from several different Navy and Army commands as well as representatives from other Federal Agencies and the civilian sector assisted with or were consulted on matters related to the Navy's inquiry. Our society is an open one and the current era is one of aggressive investigative reporting; source information is provided to the news media by many different sources. Because of these factors, it was decided that a full scale leak inquiry would not be conducted. If however, the identity of a leak or media source was made known, appropriate action would be taken.

U.S.S. "IOWA" GUN TURRET EXPLOSION

Senator DIXON. In the information given to the FBI for a psychological profile of Petty Officer Hartwig, I understand that the Naval Investigative Service said that Hartwig was a homosexual, based on a report from a sailor which was later recanted by that sailor. Did the Naval Investigative Service inform the FBI that the sailor had recanted his story?

Mr. POWERS. The Naval Investigative Service provided a briefing and documentation to the National Center for Analysis of Violent Crime, Federal Bureau of Investigation (FBI), Quantico, Virginia, that included interviews of witnesses and family members who expressed their opinion that Petty Officer Hartwig may have been homosexual or exhibited homosexual tendencies. The FBI was informed that a sailor who had provided two statements concerning Petty Officer Hartwig had recanted portions of his statement.

CHEMICAL ANALYSIS OF COPPER BAND

Senator DIXON. The Navy says that the copper band is an uncontaminated "time capsule" of the explosion. If that is so, why has the Navy been unable to come up with any chemical device whose chemical analysis matches that of the *Iowa* Band? Why is there no exact match?

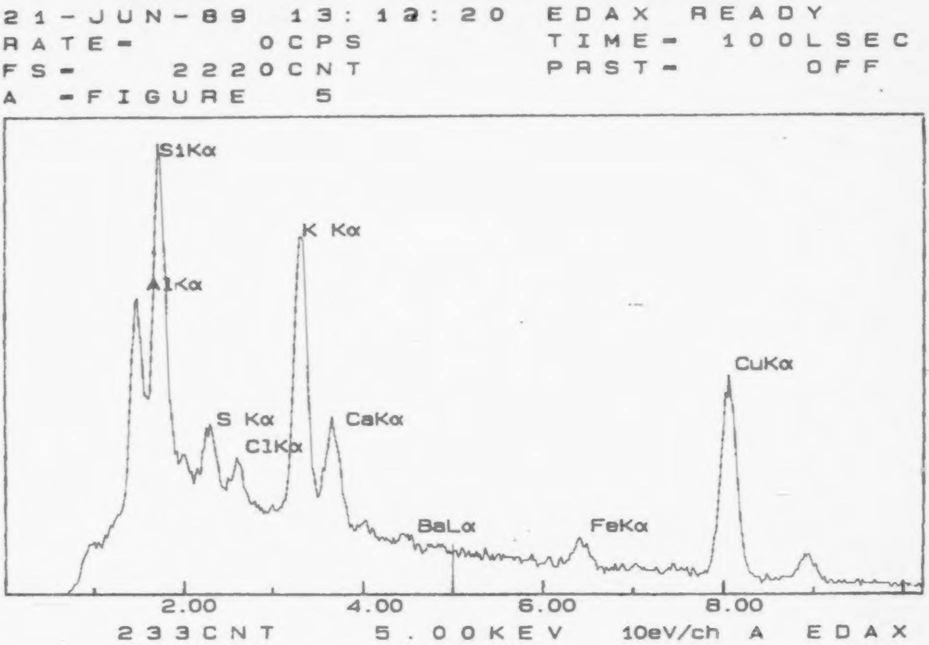
Captain MICELI. The Navy conducted two open breech burning tests in which a chemical device (calcium hypochlorite, brake fluid, and steel wool) was used to initiate the explosion. The iron fibers found in the rotating bands from these tests had a coating of calcium, chlorine, and oxygen. The analysis also identified the glycols from the brake fluid as well as the polyethylene from the plastic bag used to contain the chemical device. The iron fibers found in the rotating band of the *Iowa* projectile had the same coating of calcium, chlorine, and oxygen. Three glycols, two of which have no identifiable source in any material used in the ship, as well as plastic fragments identified as polyethylene-polyethylene terephthalate were also found in the *Iowa* rotating band. The Navy concludes that a good match to the chemical analysis of the residue in the *Iowa* band has been provided by the tests using a chemical device.

CHLORINE IN "IOWA" BAND

Senator DIXON. In Captain Miceli's August 11 report, a chart shows that there is no chlorine in the *Iowa* band. Yet, in the final September 7 report the Navy says there is chlorine in the *Iowa* band. Why the difference between the two charts?

Captain MICELI. The analysis by the Norfolk Naval Shipyard laboratory had found chlorine in the *Iowa* band, but the focus of their analysis was on other elements. The fact that chlorine was not shown in the chart in the August 11 report was simply an oversight. A copy of the spectra from the scanning electron microscope analysis by the shipyard of a particle from the *Iowa* showing the presence of chlorine is attached. Also, the shipyard did not investigate the iron wire. The results which were available at the time of the August 11 report were those from the Shipyard's analysis. The Crane analysis, which had only started by the time of the

August 11 report, was where the strong evidence of the chlorine was found. This is why the chlorine was shown in the September 7 chart.



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21-JUN-89  13:12:20    EDAX  READY
RATE=     0CPS         TIME=  100LSEC
FS=    2220CNT         PRST=      OFF
A  =FIGURE   5
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FIGURE 5

FOREIGN ELEMENT QUANTITIES

Senator **Dixon**. Can the Navy please provide the exact quantities of each foreign element found on the *Iowa* band, as well as the quantities of each element found bands—both timing device and chemical device?

Captain **Miceli**. A quantitative comparison of the foreign elements found in the *Iowa* band and in the bands from open breech shots fired with a timing device can be provided from the analysis done by the Norfolk Naval Shipyard. A summary table with these data is attached. Similar data cannot be provided for the bands from the shots using a chemical device. The reason for this is that the FBI advised the investigation in early August that simple differences in levels of chemical elements were not adequate proof of the presence of a device. Their advice was that it was necessary to find distinctive materials (a chemical compound, a fiber, a piece of glass, etc.) which could be traced to a device. Thus, in the subsequent analysis conducted by the Naval Weapons Support Center, Crane, the focus was on demonstrating the presence or absence of such distinctive materials. Further quantitative elemental analysis, similar to that done early in the investigation by the Shipyard, was not continued. The Navy's conclusions as to the cause of the incident are not based on an elemental analysis but on the presence of foreign (distinctive) materials in the *Iowa* band.

Comparison of Quantitative Analysis of Foreign Chemical Elements

[By the Norfolk Naval Shipyard]

	Level of barium [ppm]	Level of calcium [ppm]
IOWA Band	480	1250
Electronic device initiated test bands	565	725

[ppm]: parts per million.

CONTAMINATION OF "IOWA" BAND

Senator **Dixon**. Is it true that there was so much contamination on the *Iowa* band from "Break Free" that it is likely that at least some of the foreign elements in the band had to have been introduced during the removal of the band from the gun?

Captain **Miceli**. The foreign materials (not elements) which the Navy's investigation has found (iron wire coated with calcium, chlorine, and oxygen; glycol chemical compounds; plastic materials; and others) could not have been introduced by the

Break Free CLP during the removal of the projectile from the gun barrel. All of the open breech burning tests conducted as part of the investigation included the use of Break Free CLP to clean the barrel. In one control test, steel wool was placed in with the bag charges as a contaminant. The iron wires found in the rotating band after the test did not have the matching coating to those found in the *Iowa* band. We have carefully checked all materials which might have been present as potential sources for the foreign materials found in the *Iowa* band.

As regards the introduction of contaminants during the removal of the projectile, it must be remembered that a force of approximately 1,000,000 pounds was exerted on the projectile to engrave it into the rifling during incident. The radial pressure on the rotating band from the gun barrel was over 14,000 pounds per square inch after the event was over. This resulted in the opening into the "trap" area of the band being only 5 micrometers or less. The iron wires found in the trap area were 60 micrometers or greater in diameter; they could not have been introduced into the trap area after the event was completed (i.e., during removal of the projectile). In addition, the iron wires were actually imbedded into the ring, which could only have happened when the copper metal of the ring was soft from the heat of burning propellant gases.

U.S.S. "IOWA" GUN TURRET EXPLOSION

Senator DIXON. Did the Navy ask the FBI to determine whether the *Iowa* incident was an accident or not? Or, did the Navy ask the FBI to determine whether Hartwig or Truitt was responsible. What exactly was the charge to the FBI?

Mr. POWERS. The FBI at the National Center for Analysis of Violent Crime, Quantico, Virginia, was not asked to determine whether the *Iowa* incident was an accident. The FBI was advised that no accidental cause for the accident had been discovered at the time FBI assistance was requested. The Naval Investigative Service did not ask the FBI to determine whether Hartwig or Truitt was responsible. After the FBI was briefed on the investigation, they were asked to provide some insight into Hartwig's personality. The FBI was asked to provide a profile of Hartwig and to determine if Hartwig was capable of committing such an act.

Senator DIXON. Did the Navy tell the FBI that Hartwig had been turned down for a new assignment in London? Had he? Or had he been approved for the posting? Was he being considered? What was the status of his transfer application, and what did he know about it?

Mr. POWERS. The FBI was provided with all the information that NIS had developed in regards to Hartwig's possible transfer or assignment to London. That information was confusing in that inquiries on the *Iowa* disclosed that Hartwig had been told that he was not eligible for such an assignment; however, NIS inquiries at the Naval Military Personnel Command (NMPC) indicated that his transfer was still being processed. Unfortunately, Hartwig's file at NMPC, which was held by detailers handling the transfer, was destroyed when Hartwig was identified as one of the casualties on the *Iowa*. No orders had been issued to Hartwig assigning him to London.

Senator DIXON. How much of the NIS information did the FBI actually take into its possession? Could you please furnish a list of this material? Was the FBI in each case provided with the recantations by witnesses who changed their testimony prior to the initial writing of the report?

Mr. POWERS. The following is a listing of the dates NIS met with the FBI agents at the National Center for Analysis of Violent Crime and the information provided at each meeting:

May 23, 1989—Copies of memo and steno pads which passed between Hartwig and Truitt were provided to FBI.

June 2, 1989—Exhibits provided to FBI (from June 21, Report of Investigation): 165—Harry D. Freeman, 168—Mark S. Elkins, 39—Edward J. Stark, 71—D.P. McElyea, 159,160—Adam Jason Zion, 104—K.L. Truitt, 78—Charlene Meter—All letters to and from Hartwig, 8—Evelyn S. Hartwig, 72—Brian Hoover, 7—K. Kubicina, 77—Pam G. Hartman, 73—Angel Baker, 107—Carol Truitt, 100,101—John Mullahy, 149,150—Joseph Glynn, 80,81—Michele Poling—All letters to and from Hartwig, 10—Photographs of Hartwig's room in Cleveland, OH.

June 15, 1989—Exhibits provided to FBI (from June 21, Report of Investigation): 146—Poem "Disposable Heroes," 153,156—David Smith.

August 2, 1989—Exhibit provided to FBI (from August 29, Report of Investigation): 20—Nathan A. Estey—transcript.

The only individual that has recanted a portion of his statement to NIS is David Smith. The FBI was advised of Smith recanting a portion of his statement on June 15, 1989.

[Whereupon at 1:16 p.m., the hearing was adjourned.]

REVIEW OF THE DEPARTMENT OF THE NAVY'S INVESTIGATION INTO THE GUN TURRET EXPLOSION ABOARD THE U.S.S. "IOWA"

MONDAY, DECEMBER 11, 1989

U.S. SENATE,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

The committee met, pursuant to notice, at 9:08 a.m., in room SH-216, Hart Senate Office Building, Senator Sam Nunn (chairman) presiding.

Committee members present: Senators Nunn, Dixon, Warner, and Cohen.

Committee staff members present: Arnold L. Punaro, staff director; Richard D. DeBobes, counsel; and Marie Fabrizio Dickinson, assistant chief clerk.

Professional staff member present: Norman G. Mosher.

Minority staff members present: Patrick A. Tucker, minority staff director and counsel; John E. Mansfield and Mark B. Robinson, professional staff members.

Staff assistants present: Lori M. Jackson; Kelli J. Pronovost; Melissa A. Ramsey; and Debra A. Rice.

Committee members' assistants present: Jeffrey B. Subko, assistant to Senator Exon; William J. Lynn, assistant to Senator Kennedy; Charles C. Smith, assistant to Senator Dixon; Milton D. Beach, assistant to Senator Glenn; Terrence M. Lynch, assistant to Senator Shelby; Dale F. Gerry, assistant to Senator Cohen; and Charles G. Pearcy, assistant to Senator Lott.

OPENING STATEMENT OF SENATOR SAM NUNN, CHAIRMAN

Chairman NUNN. The committee will come to order.

The committee meets this morning for the second of a series of hearings on matters associated with the explosion on April 19, 1989 in the center gun of turret II on the U.S.S. *Iowa* which resulted in the deaths of 47 Navy personnel. The first hearing in this series took place on November 16 and included the testimony of Rear Adm. Richard D. Milligan, the investigating officer, and the testimony of the director of the technical support team and the director of criminal investigations of the Naval Investigative Service.

This morning we will receive the testimony of Capt. Fred P. Moosally, Jr. of the U.S. Navy, Commanding Officer, U.S.S. *Iowa.* Captain Moosally assumed command of the U.S.S. *Iowa* in May 1988.

The U.S.S. *Iowa* is the second of four battleships that were recommissioned during the 1980s at a total cost of about $1.5 billion.

She was previously commissioned in February 1943 and then again in April 1951. The purpose of this series of hearings is to attempt to assess the adequacy of the Navy's investigative report and also to assess the accuracy of its conclusions. Additionally and on a broader scale, we intend to explore the adequacy of the Navy's support and employment plans for the U.S.S. *Iowa* and her other sister battleships.

I outlined in my opening statement at our last hearing the problems found by the investigating officer in the weapons department of the *Iowa*. It must also be noted that testimony was received during the course of the overall Navy investigation that cast doubt on the Navy's support for the U.S.S. *Iowa* and, by implication, for the other three battleships. The Navy's investigation did not inquire into these matters, but we will this morning. They include:

First, the priority of officer and enlisted manning and the quality of personnel on board the U.S.S. *Iowa;*

Second, the adequacy of training on the 16-inch guns since there is no hands-on training for personnel prior to reporting to the battleships;

Third, the employment plan for battleships, how they will be used tactically and strategically;

Fourth, the responsiveness of the Navy to repair and repair part requests for battleships; and

Fifth, the adequacy of various inspections and surveys conducted on board the battleships.

As indicated at our last hearing, I have requested the General Accounting Office to look into these matters as well as to review the Navy's investigation as a whole in an attempt to assess its adequacy and to determine whether its conclusions are correct.

I am pleased to note that the Sandia National Laboratories has agreed to assist in this endeavor by analyzing the rotating band that was removed from the projectile that was in the barrel of the gun in which the explosion occurred. Sandia's analysis will attempt to determine the presence and nature of foreign materials on the rotating band. Additionally, they will attempt to determine if the Navy's hypothesis as to the detonators and the initiation of the explosion are consistent with any materials that may be found.

This afternoon we will have witnesses from the Federal Bureau of Investigation who will testify as to the results of the analysis of the rotating band performed by their laboratory and the equivocal death analysis prepared by the FBI's National Center for the Analysis of Violent Crime.

Let me make sure I am pronouncing that correctly. Moosally?

Captain MOOSALLY. That is close, sir. That is good enough.

Chairman NUNN. Close is good enough for a southerner, I guess.

This morning we want to give Captain Moosally an opportunity to respond to the finding of the Navy's investigation and to explain his testimony during the investigation as to the lack of support to the U.S.S. *Iowa* in connection with manning, training, repair and inspections and surveys as well as his perspective on the Navy's employment plan for battleships.

Captain Moosally is appearing in his individual capacity as the commanding officer of the U.S.S. *Iowa,* and the committee will, of course, expect you, Captain, to give your personal views. We are not asking for the Navy's views today. We are asking for your views individually.

I should note at this point that the *Iowa* returned just last Thursday from a 5-month deployment to the Mediterranean.

Captain Moosally, we certainly appreciate your presence here this morning, particularly in view of the fact that you have just returned from what must have been a very difficult and demanding deployment, since it took place so soon after the tragic explosion of April 19.

I also want to point out at this time that the Navy's investigation found that in the aftermath of the explosion, "the damage control efforts of the ship's crew were extraordinary."

Senator Warner, why don't you give your opening statement, and then I will have another announcement about plans for the committee that have nothing to do with this hearing.

Senator WARNER. Thank you, Mr. Chairman. I join you in welcoming the Captain. The Captain is no stranger to Capitol Hill. You served here in the capacity of a liaison officer for many years. This is the first opportunity for you publicly to express your views about this tragedy, and I know that you will do so in a manner which is consistent with the unusual situation that the Navy is in at the present time.

We have seen a series of tragic accidents throughout the Navy. In my own opinion, they are not linked in any way, but what you say here today will have a heavy impact on thousands and thousands of families who are waiting for their sailors to return home from deployments across the oceans of the world. I hope, therefore, that you, as the others have, will exercise great care in the expression of your opinions about this tragedy.

The committee is anxious to determine whether or not in its judgment the Navy acted properly. I spoke with the Chief of Naval Operations this morning. He stated, first, that he welcomed this hearing and the fact that we would be able to get your testimony public; and second, he stands foursquare behind the work that has been done thus far by the Navy on this particular case.

So we welcome you this morning, and we wish you well.

Chairman NUNN. Thank you, Senator Warner. Senator Dixon.

Senator DIXON. Thank you, Mr. Chairman. Mr. Chairman, today's hearing is the second this committee will conduct on the *Iowa* tragedy. We will be hearing this morning from Captain Moosally, the commander of the *Iowa* at the time of the accident, and this afternoon we will hear from representatives of the Federal Bureau of Investigation.

As I pointed out previously, there seems to be reason to believe that the training of the crew of the *Iowa* was lacking in significant respects. Captain Moosally, in his statement before Admiral Milligan's accident investigation board, indicates that when he took command of the *Iowa* there were major problems in the gun turrets, such as, and I quote directly, "hydraulic leaks all over the place, lighting that did not work. They had 25 watt bulbs in because they were afraid they'd blow fuses at the 50 watt level."

The Captain further indicates that there had been a misfire in turret I. The *Iowa* had shortages in trained manpower, and that when he inquired about replacements he was told his ship was 37th on a priority list for replacements.

Captain Moosally indicated that there was not even a Navy school for training on 16-inch guns. He stated that he was given "dopers" and poorly-trained officers and enlisted men to operate the *Iowa*.

Captain Moosally is not going to be able to testify on the actual investigation of the accident, Mr. Chairman, but I do think his testimony concerning the conditions on the ship at the time of the accident will help this committee form a better picture of the situation on the ship. The Captain's appearance, therefore, is essential to our review of the *Iowa* tragedy.

Mr. Chairman, my staff along with Senator Metzenbaum's staff has reviewed the FBI's death analysis report which Admiral Milligan seems to have relied on as support for the conclusion that Petty Officer Hartwig was responsible for the disaster.

Because the Naval Investigative Services failed to provide the FBI with complete information, however, the Bureau's conclusion that "Hartwig died as a result of his own actions, staging his death in such a fashion that he hoped it would appear to be an accident" in my opinion is very much open to substantial and considerable doubt.

Mr. Chairman, Senator Metzenbaum wanted to be at today's hearing but because of a previous commitment cannot be here.

I look forward to hearing the facts today. I want to personally thank the chairman for his usual careful evaluation of all matters concerning our armed services, and I thank him for the opportunity to be here for this hearing today.

Chairman NUNN. Thank you very much, Senator Dixon.

Captain, we will turn to you in just a minute. Let me first make an administrative announcement.

Tomorrow morning at 9 a.m. in this hearing room the committee will conduct a hearing on the issue of warning time in central Europe and the impact of any changes on U.S. defense force structure and budgets. We will be asking particularly about the recent studies that have been publicized in the news media.

Our principal witness will be Under Secretary of Defense for Policy, Paul Wolfowitz. He will be accompanied by senior military and intelligence officials.

I have also asked Secretary Wolfowitz to address the process by which the Department of Defense is assessing the changes and the threats, making adjustments to our military strategy and our defense force structure and budgets.

Our focus will not be precisely on what they are concluding. We do not believe they have reached a lot of conclusions yet, but really, we are going to focus on how they are going about it. Of course, whatever conclusions they have reached and whatever information they have that can be made public we have urged them to do so at this hearing.

Committee members received advance notice of this hearing last Monday.

The second hearing was announced on November 29. The committee will be conducting a hearing on Tuesday, December 19 at 2 p.m. in Senate Russell 253 with outside witnesses on the nomination of Mr. Victor Stello to be Assistant Secretary of Energy for Defense Programs. There will be several panels of witnesses including Mr. Stello. I wrote each member on November 29 with this information.

Captain, we are delighted to have you this morning. Again, we thank you for coming. I know you have just gotten back. You have had a weekend, but not much time to recover from a long stay at sea. We appreciate your being here today, and we look forward to receiving your testimony.

STATEMENT OF FRED P. MOOSALLY, CAPTAIN, U.S. NAVY, COMMANDING OFFICER, U.S.S. "IOWA"

Captain **Moosally**. Good morning, Mr. Chairman, Senator Warner, Senator Dixon. I am Captain Moosally, the Commanding Officer of the battleship *Iowa*. I was born and raised in Youngstown, Ohio, and graduated from the U.S. Naval Academy in 1966. For 23 years I have dedicated my life to the naval service, serving on six ships and previously commanding the U.S.S. *Kidd*.

I want to thank the committee for the opportunity to be here today to discuss with you the battleship *Iowa*.

Mr. Chairman, you have before you a paradox, a tale of two ships. One ship is this *Iowa* you read about in the newspapers, a ship of laid back attitudes, failure and ineptitude. The other *Iowa* is the *Iowa* that I command, an *Iowa* that is well trained, well maintained and professional.

You have heard many things about the other *Iowa*, but the one I command is an *Iowa* to be proud of, with a crew that deserves much more credit than they have been given.

I assumed command of the *Iowa* in May 1988, and over the last 19 months my crew and I have proved that *Iowa* is one of the best ships in our Navy. Mr. Chairman, this is a fact, not because I say so, but because *Iowa's* track record of proven performance in every area of naval operations prior to April 19, on April 19, and every day since April 19 says so.

We men of the *Iowa* are proud of our ship. I hope that today I can convince the Congress, the American public, and most important, the families of our fallen shipmates, some of whom are here today, that the *Iowa* described in the press never existed.

Having completed a 6-month deployment for America, we ask that America give us the chance to set the record straight. We have earned that right.

Prior to the explosion on April 19, I took the ship through an extended shipyard period; workups to deployment that included four weeks of dedicated, intensive refresher training at Guantanamo Bay, Cuba; an operational propulsion plant examination; naval gunfire support qualifications; a major planned maintenance inspection; a nuclear weapons acceptance inspection; a major fleet exercise; and an in-depth materiel inspection by the Board of Inspection and Survey.

Iowa was on track and had completed all predeployment hurdles the first time with flying colors.

After the explosion, I directed the heroic efforts of *Iowa's* crew as they courageously fought fires and recovered their fallen shipmates.

I witnessed both the tragedy where 47 of our shipmates died, and the birth of hundreds of heroes. I stood with my crew as we rebuilt our ship in the face of overwhelming emotion and grief.

During the weeks that followed, *Iowa* worked with investigators providing hundreds of hours of testimony while rebuilding our ship. At a time normally associated with liberal leave and liberty in preparation for a 6-month deployment, the crew selflessly devoted thousands of additional manhours, working side by side with workers from Norfolk Naval Shipyard, to evaluate the extent of damage and restore vital systems in turret II.

Throughout this period, there was an air of uncertainty as to whether we would be allowed to deploy. This only made our *Iowa* crew double their efforts to ensure that we would not only be ready, but ready on time. We maintained this superhuman effort despite the flood of media who came to our homes and tried to interview us in town or just outside the naval base gate.

Iowa was front page news. Speculation, innuendo and out-of-context quotes were rampant. We even had to endure media interviews with Navy deserters, one of whom appeared on television with a pillowcase over his head, claiming to be an expert on our ship. Still, we remained silent and continued our predeployment preparations.

We made the necessary sacrifices under the most stressful, adverse, and unusual conditions ever encountered in a peacetime environment. Just 7 weeks after a devastating explosion aboard our ship, we deployed.

That fact alone reflects the high level of leadership, morale, readiness and training aboard our ship prior to and after April 19. It also supports my conviction that *Iowa's* command standards are solidly built on a commitment to excellence.

Two months into our deployment we were in Marseilles, France, when the message came to sortie to the eastern Mediterranean in response to the murder of Colonel Higgins. As in every time in her history, *Iowa* answered the call. Steaming at 25 knots, we arrived off the coast of Lebanon in 3 days.

Because a large number of contingencies might include long-range gun strikes, the fleet commander gave permission to ready our turrets and begin extensive drills, including live firings.

It was a difficult decision to order the first rounds loaded and shot, without knowing with certainty the cause of the April 19 explosion.

Confident in our training and our safety and our readiness, we fired 108 rounds of 16-inch 50 ammunition during the month of August. Our training readiness was dramatically validated during one of these gun shoots, when our 16-inch guns hit a 10-foot diameter target balloon on the third round at 18,000 yards, or 9 miles.

I submit that you cannot do these things without good leadership and a well established, effective training program. Exactly 3 months after our deployment began, just 2 days prior to its formal release, we got our first chance to look at the official investigation report. Prior to this, we relied on the media and our families for information.

Chairman **Nunn**. Captain, could you repeat the date you got a chance to look at that? I did not get that.

Captain **Moosally**. That was 2 days prior to the release of the—I think it was on the 5th of September. It was the Labor Day weekend.

Chairman **Nunn**. Thank you.

Captain **Moosally**. Prior to this, we relied on the media and our families for information. When I received the report I was horrified to learn that the explosion was caused by a wrongful, intentional act. It is very difficult for any family to accept that one of its own could do such a thing.

In the days following the release we were dismayed with the report's emphasis on the apparent shortcomings of my command. While these shortcomings had no causal effect on the explosion, they were difficult to separate from the actual conclusion of the report and have become the source of much confusion.

I would thus like to clarify a number of misconceptions by focusing on some critical facts, which appear to have been lost in the shuffle. These facts are based on close inspection not only by myself and my crew, but from competent outside sources, both uniformed and civilian, including fleet commanders, senior Navy civilians, the Navy Inspector General, and the Government Accounting Office.

Fact number one: *Iowa* was and is well trained. Much has been said about *Iowa's* PQS program. PQS is a list of minimum knowledge and skills required to perform certain duties.

Let me set the record straight. Our men had the skill, training and experience to perform their assigned tasks. Our only deficiency was in maintaining a formal record of these skills.

Let us look at the record of *Iowa's* contribution to 16-inch gunnery to put things in perspective. *Iowa* gunners were the major contributors to the revised 16-inch 50 PQS standard book being used in the fleet today. In other words, we wrote the book on PQS.

Iowa gunners were instrumental in setting the standards in 16-inch gunnery in the Navy. *Iowa* was a major contributor to the Navy's 16-inch gunnery handbook. *Iowa* developed the grading criteria for the Navy's 16-inch 50 naval gunfire support exercises. *Iowa* also wrote the combat systems assessment 16-inch 50 test questions for the type commanders combat systems mobile training team.

Our demonstrated expertise in shooting and excellent materiel condition are indicative of the high level of leadership, training and safety on *Iowa*.

Six months prior to the explosion, *Iowa* successfully completed a month-long refresher training in Guantanamo Bay, Cuba. In December, we successfully completed an ordnance handling safety assist team visit, which cited our gunners' knowledge, procedures and accountability as excellent.

We completed naval gunfire support training in Puerto Rico and achieved a final average of 88 percent, the highest ever on a battleship.

We also successfully completed a nuclear weapons assist team visit, and a nuclear weapons acceptance inspection.

A NAVSEA explosive safety review team also visited *Iowa* and remarked on our high quality training in the turrets, particularly in turret II.

One of the inspectors stated that he found the personnel well versed in their professional certifications for 16-inch guns, and the training records all well documented and maintained. He examined 12 records in-depth for turret II, in particular, and found no deficiencies in their certification program for non-nuclear ordnance.

These records were maintained within the turret.

In March 1989, *Iowa* was visited by the COMNAVSURFLANT Combat Systems Assessment Team. The team cited *Iowa* as being clean and professional, with all areas inspected reflecting good leadership and management. All main battery officers were given written examinations and all were graded as satisfactory. Also cited was the crew's obvious pride in their equipment and systems.

The team also indicated that they reviewed all weapons department administration and PQS and found them satisfactory for all weapons systems. In fact, the chief inspector of the team indicated to me that we were better than most ships with respect to PQS training, and he had no negative comments.

The weapons department was cited by the team for its meticulous attention to detail and its administrative programs. The team's findings were no surprise to me.

We constantly train on our guns, shooting as often as we can. Between August 1988 and April 1989, we conducted 38 firing exercises, shooting 574 rounds of 16-inch ammunition at various targets ashore and at balloons.

This is real training and proven performance by well trained and motivated gun crews towards that one real goal, to safely put ordnance on target.

In May, just 1 month after the explosion, the Commander of Naval Surface Forces Atlantic Fleet directed my squadron commander to conduct an additional inspection of *Iowa's* PQS. A Navy captain personally conducted the inspection. *Iowa* successfully passed. His report found the training to be what we had said all along.

The Commander of Naval Surface Forces sent his own combat systems inspection team to the ship the next day to verify the results. They found the same thing. *Iowa's* program was pronounced effective with 100 percent review of instructions, personnel service records and oral-boards. This team found *Iowa's* non-nuclear ordnance handling program the best on the water front.

In other words, the same personnel in turrets I and III, who were found administratively not qualified during the investigation, were found fully qualified by two different inspection teams on June 1, without any training or shots fired since April 19. And as I have always said, turret II was my best turret.

I will also state right here that the administrative documentation or paperwork deficiencies found during the investigation were corrected aboard the *Iowa* in 2 days. These facts, along with previous inspection results, are testimony to an established and effective training program already in place aboard our ship on April 19.

Fact number two: *Iowa* was and is well maintained. After completing refresher training in November 1988, we successfully completed an extensive operational propulsion plant examination. Then after the first of the year, *Iowa* completed a comprehensive planned Maintenance System inspection which resulted in a recorded accomplishment rate of 99 percent. Within *Iowa's* turrets, 100 percent of the spot checks done by the inspectors were graded satisfactory.

Again in March 1989, just 3 weeks prior to the April 19 explosion, our ship completed one of the most difficult inspections in the Navy conducted by the Board of Inspection and Survey. In that one inspection, all ship systems and equipment were inspected to determine their fitness for further service. This was the first time *Iowa* had successfully completed this inspection since her commissioning in 1984.

This time, the inspection team rated *Iowa* fit for further service, finding that the entire ship from stem to stern, including the ship's turrets, were in satisfactory materiel condition. *Iowa's* engineering plant met every test, including a full power run where the ship reached a sustained speed of 34 knots. The team's findings prompted a "well done" from COMNAVSURFLANT to *Iowa's* weapons department, among others, for its performance during INSURV and specifically for being the first battleship to pass the anti-air warfare detect to engage test.

Finally, I know *Iowa's* condition through personal inspection. Each day I walk through the sections of the ship to see the crew and to look at the spaces. There is not one of the ships' 1,500 compartments which I have not been in, most of them numerous times.

We also conduct biweekly zone inspections aboard *Iowa*. This inspection requires my officers and chief petty officers to inspect and note deficiencies on every compartment aboard the ship. The combination of shipboard and Navy inspections provides a good reference as to the condition of the ship at any time.

Iowa's materiel condition belies her age. She is in excellent shape. The fact that we deployed for 6 months with no maintenance availability is testimony to our sustainability and our self-fix capability.

Fact number three: *Iowa* did not experiment. Let us set the record straight. There was never a shot fired during my command that was not safe and sanctioned by the appropriate authorities. The fact is, *Iowa* fully supported 16-inch 50 gunnery improvement and worked closely with the Navy's ammunition experts.

The purpose of *Iowa's* main battery is to put ordnance on target at maximum range with the highest possible effectiveness. We constantly work at precision prior to every shoot. We discipline ourselves to perform all the scientific calculations to know the precise initial velocity of the projectiles.

From taking the temperature of the powder to calculating atmospheric anomalies, we are able to make predictions about projectile gun performance and consistently place initial rounds within a few yards of the target.

The Naval Sea Systems Command, Naval Surface Warfare Center, Dahlgren, and other commands have asked us on numerous occasions to fire rounds or powder combinations that have been thoroughly tested ashore. The reason we are asked to do this is for the reasons I have stated before. *Iowa* consistently does the homework necessary for accurate shooting every time. The ordnance experts know we will give them the most accurate data and know that we will do the job safely.

In addition, these operational tests help the Navy to check the land-based test results and to devise procedures for their use in the fleet. Special 16-inch rounds were tested aboard *Iowa* from 1987 under the full approval of the Naval Sea Systems Command. When tested, the crews were fully briefed, and NAVSEA and Dahlgren personnel were aboard for the tests.

In November 1987, *Iowa* conducted operational tests using five-bag DD–846 incremental charges with 1,900 and 2,700 pound projectiles. Eighteen rounds were shot. Incremental charges are powder loads less than a full charge, which is six 110 pound bags of propellant. The tests were conducted with NAVSEA personnel on board.

The use of incremental charges are not without precedent. Range tables for incremental charges were developed in World War II.

In March 1989 at the annual Battleship Improvement Conference hosted by Naval Sea Systems Command, the advantages of using incremental charges were discussed in detail as a method to dramatically increase the accuracy of the 16-inch gun system and substantially reduce gun wear. This procedure is viewed safe by NAVSEA personnel, and firing the five-bag incremental charge, in my view, is not unsafe, as bore pressures generated are well below the allowable proof pressure of the 16-inch gun. We have been told that testing at Dahlgren subsequent to the explosion on *Iowa* confirms this fact.

On April 19 my weapons department personnel believed that the firing of the five-bag incremental charge was fully sanctioned, and they planned to fire it from turret II. They failed, however, to brief me properly, and the firing plan I signed indicated we would be firing reduced charges, six bags of 55 pounds each from both turrets I and II. Turret III was never planned to be fired.

I would not have allowed the firing of incremental charges because, although they had been fired aboard *Iowa* before I took command, there is no formal authorization for this method of firing. Needless to say, I was disappointed with my subordinates for preempting my command prerogative. As you know, they have been punished for their actions.

Having said the above, I want to make it clear that the actions of these men were out of character. They have before and after April 19 been completely loyal, supporting and obedient subordinates. Their only objective was to prove that the variety of applications of which the 16-inch 50 gun is capable. What they were doing was not unsafe. Their error was that they did not properly brief me on what they wanted to do and get formal approval.

Fact number four: *Iowa* was and is well led and well managed. The officers and chief petty officers serving under me are real professionals. They are well disciplined and knowledgeable in their fields. I cannot praise them enough.

After the release of the investigation, my sworn personal testimony was taken apart and used out of context. I described very directly the conditions I found in specific areas when I assumed command. Those conditions do not exist aboard *Iowa* today.

At one point my testimony was used to indicate that I was not happy with my crew. Nothing could be further from the truth. The truth is I was asked specifically why I had certain personnel in turrets who had disciplinary records. In that case I did reply that I had to work with what I got from the Navy. I have little control over the people who come to my command, and, yes, I have an obligation to provide leadership to my men.

Still, I have had to send some men out of the Navy who were not doing their jobs and who refused to change. Those men who make an effort are a welcome part of the *Iowa* family.

The bottom line on leadership in *Iowa* is that we have it in spades. My officers, chiefs and leading petty officers get into their spaces daily to assess the progress of our crewmen for themselves. I have always believed that if you expect extra effort from people, then you should make the extra effort to go to the spaces and see their work, show them that you are interested and care for them.

That is why I personally make daily trips around the ship. It allows me to know my crew, to see their work and to take action on areas I see that need extra effort. I invest a lot of time in these daily tours, and I believe that the crew of *Iowa* has a high morale and accomplishment record because the ship's leadership does take the time up front to care for our people.

Again, I submit that if you review our record of performance and measure what it takes to overcome tragedy, to deploy on time, to have the meaningful deployment we had in the face of tremendous stress brought on by the investigation and unfavorable press reports that followed, you cannot help but conclude that *Iowa* is well led.

Fact number five: *Iowa* was and is ready. Just look at the response to the explosion itself to assess our readiness. On April 19 the crew fought bravely to put out the fire from the explosion. The response was immediate. We were able to contain an explosion and fire which might have destroyed any other vessel. The crew then tirelessly worked throughout the night and the next day to dewater the spaces and recover their fallen shipmates. With that accomplished, we went back to work and made our deployment. We were ready.

These, however, are not the only areas for judgment. One can look at how *Iowa* was progressing toward deployment to see that she was ready. *Iowa* had passed every exam prior to April 19. She had proven herself in test after test. There is no better gauge of a crew's readiness than a ship being able to meet her commitments, passing all three deployment examinations. All these things, *Iowa* did and did well.

Iowa is still ready. We proved our readiness again in the eastern Mediterranean when, after a 4-month moratorium on firing our 16-inch guns was lifted, we safely fired 108 rounds to prepare for contingency operations. Within the first few shots we were on target. Such feats cannot be accomplished by an ill-trained, unready crew.

They do, however, graphically demonstrate the true character of *Iowa's* professionals. We maintain our high capabilities because we take pride in our abilities and we are unwilling to accept second best.

Adm. J. D. Williams, Commander of the 6th Fleet, has often commended *Iowa*. I am making available a letter he wrote to our families in which he stated, "There is precision and pride in everything *Iowa* does. *Iowa* guns are always on target." Admiral Williams also stated that he considers *Iowa* a major national asset with an outstanding and truly remarkable crew. These are observations made after 3 months of wide-ranging operations.

Finally, *Iowa* has pride and endurance. It has been painful to watch so-called experts slowly erode the Nation's confidence in our ship and in us. We have worked together to prove to others that we can do the job, and we are here today to tell you that we are the best team on the best strike platform in the Navy.

The fact that *Iowa* had an unmatched capability to deliver ordnance on target was a major factor in the recent approval of a gap in the aircraft carrier presence in the Mediterranean. There is a plaque mounted on our bridge which states, "We are battleship sailors. When it's getting too tough for everyone else, it's just right for us." You can believe it.

Recently GAO investigators joined in praise of our ship They saw the courage and training of our crew and the sturdiness and order of *Iowa*. They echoed the sentiments of our prior inspectors and said that they, too, would be willing to go to war with us.

They proved their confidence by joining us in the gun rooms of the turrets while we fired. There is no higher testimony to a crew or ship.

Admiral Howe, the Commander in Chief, U.S. Naval Forces Europe, summed it up when he said of *Iowa*, "The real winners are those who can take a hit and come back strong. You are true winners." This is the *Iowa* I command. The *Iowa* you read about in the press does not exist. The real *Iowa* and her crew are here today, well trained, well disciplined, well lead, and ready for your personal inspection.

Many in Congress know the *Iowa* I command. They have come aboard to see her firsthand and already know the pride we have in our ship and ourselves. It is something that is apparent immediately upon setting foot aboard.

We invite you to visit us anytime to see our ship and talk to us. I believe you, too, will come away with the same pride that I feel in this crew every day. They have proven themselves worthy of praise, worthy of support, and worthy of the pride we ourselves share in our Nation's cause. Together we are the *Iowa*.

Thank you, Mr. Chairman.

Chairman NUNN. Thank you very much, Captain.

We are going to rotate the questioning this morning and take about 6 minutes each. Let me just start by quoting some of the testimony that you gave. When was your interview with Admiral Milligan?

Captain MOOSALLY. It was right after we got back, sir. I am not sure of the exact date.

Chairman NUNN. Does May 1 sound about right?

Captain MOOSALLY. Around about that time, about 2 weeks after the explosion.

Chairman NUNN. Where did that take place, Captain?

Captain MOOSALLY. It took place initially in one of our staterooms on the ship and then over at the Naval Legal Service Office in Norfolk.

Chairman NUNN. Do you recall who was present during that interview?

Captain MOOSALLY. Well, the major players—there were a few people. The major interviewers, of course, were Admiral Milligan and Commander Swanson, the legal officer, and Captain Messina, who was the assistant to Milligan.

Chairman NUNN. Was that sworn testimony?

Captain MOOSALLY. Yes, sir, it was sworn testimony. I was given my rights, and it was sworn testimony.

Chairman NUNN. And you had a reporter with a transcript?

Captain MOOSALLY. Yes, sir.

Chairman NUNN. Did they tell you the conditions of the testimony, whether it would be made available or could be made available in any kind of proceeding after?

Captain MOOSALLY. No. If I had known that, I do not think I would have stated some of the things I said there if I had known it would be a matter of public record.

Chairman NUNN. They did not tell you that it would be?

Captain MOOSALLY. No.

Chairman NUNN. Let me just quote a couple of things you said and get your reaction to them or amplifications, see if you recall exactly the context.

You stated, quoting, number one, "When I came here, you know, when I first came on here, you know, we had a NMP." Tell us what NMP means.

Captain MOOSALLY. Navy manning plan.

Chairman NUNN. Continuing, "Of 118 and I was 37 gunnersmates short at the time, I have messages where I sent messages out requesting. I also found out through EPMAC"—could you tell us——

Captain MOOSALLY. That's EPMAC, the enlisted detailers--not detailers, but the enlisted distributors of enlisted personnel.

Chairman NUNN. And BUPERS?

Captain MOOSALLY. Bureau of Personnel.

Chairman NUNN. So, quoting you again, "I also found out through EPMAC and BUPERS that the reason I wasn't getting any more gunnersmates was because I was 37th on the priority list. The basic word I was getting was that, 'Hey, you are not going to get anybody there, Captain, because you are so low on the priority list, you are never going to make it.' "

Did you so testify?

Captain MOOSALLY. Yes, sir.

Chairman NUNN. Now, tell us the context of that. Do you want to amplify it?

Captain MOOSALLY. Yes, sir. The context was that I think the manpower issue had come up. The personnel issue and the numbers of people on board and, I guess, what I was doing about it.

When I came on the ship, as you stated, I found that we were short on gunnersmates at the time. It was 37 at the time, and I was mainly concerned about shortages in the senior ratings.

Chairman NUNN. And you were trying to do something about it?

Captain MOOSALLY. I was trying to do something about it. I sent out a message on it to the proper authorities that said we were short and we needed to get more gunnersmates.

Chairman NUNN. And your response you got back was what?

Captain MOOSALLY. Well, the response I got back via the phone was well, you are low on the priority list. You are 37th on the priority list, and it is going to be a while before you see anybody.

Chairman NUNN. Going on and quoting you further,

> I have felt like the battleship has been not—kind of out of it, no employment plan. The only employment I had on my schedule was this—of termination of August of this year, no concept of operations.

Are those your words?

Captain MOOSALLY. Yes, sir.

Chairman NUNN. Tell us the context of that.

Captain MOOSALLY. Well, when I got orders to the battleship back in, I think, December 1987, like anybody going to a ship, when I started my pipeline training I was interested in the long-range schedule of the ship, and I got a copy of the long-range CINCLANTFLT employment schedule and it was indicated on there that there were a lot of blank spaces, and the only thing I saw long-range was—was the Display Determination exercise in August, which we just participated in on this deployment, and that was about a 2-month window.

The rest of the schedule after the work-ups through January was blank, so I was very concerned that we were not properly being employed and, of course, all this ties into your manning priority.

Chairman NUNN. You went on to say,

> So, I felt like we were kind of—if we would go away and hide somewhere, it would be fine with everybody, and I felt that to be 37th on the priority as the biggest gun ship in the world was kind of incredulous.

Are those your words?

Captain MOOSALLY. Yes, sir.

Chairman NUNN. Tell us a little more about that.

Captain MOOSALLY. Well, the first thing I want to say is if we would put this in perspective, it was a very emotional time for me. I just had 47 of my men die. I was being called in and given my rights, and I was very emotional about it, and when I saw what was going on in the room there—but, as I saw it, coming to the ship once again, looking at our employment schedule, and my general feeling was that we were not being employed the way the battleship should be employed.

I did not feel like manpower-wise we had the priorities we should have. I was talking as the CO of a ship, and my job as CO of a ship is to ensure we get the proper manning that we ought to have, that we are in good materiel condition. So, that was my perspective as the CO of the *Iowa*.

Chairman NUNN. Quoting you again,

> So, in summer, you know, the battleships, you know, where they do fit in as far as manning priority? You have got a tremendous ship there, a big ship, a complicated ship, and in my view the toughest ship in the Navy to run because of the age and the scope of the job, and I do not think it is properly supported as far as priority manning in the enlisted area or in any officer area.

> I get the impression the Navy has one foot in the water and one out, not really sure how the hell long they are going to stick around. We do not want to make any commitments.

Do you want to amplify that any?

Captain MOOSALLY. Sir, I think that was kind of my feeling at the time as the CO of the *Iowa*.

Chairman NUNN. You just felt like you were not being given priority?

Captain MOOSALLY. I looked at my manning once again. For example, in June 1988, if you take a snapshot, I was supposed to have eight E-7's. I had one, and that was a problem. The problem was in the E-5 and above ratings, and I did not feel like for the scope of the work that the battleship has with all the gun systems we have that we were getting the personnel we should have had in the gunnersmate rating.

Chairman NUNN. You went on to say, quoting you again,

> I found out that the Type Commander is taking billets from me to man an MTT. Now, I do not have anything to say in that. That is all being done sub rosa that I do not know anything about. I was never asked my input on anything.

Now, what is an MTT?

Captain MOOSALLY. That is a mobile training team. At the time, they were trying to man up a mobile training team.

Chairman NUNN. You felt like that was a misplaced priority?

Captain MOOSALLY. If it were taking billets away from me, I thought it was. Here I was, you know, commander of the *Iowa*, and I am trying to protect my assets, and I am looking around seeing what job has to be done, and I want it to be manned as all COs do in the way it should be manned.

Chairman NUNN. Let me go ahead and quote you again. If I could get a few more minutes, I want to finish this one line of questioning. Then I will yield.

> I must say another thing, you know,

This is quoting you—

> I must say another thing, you know. There is no school that I went to. I tried to dig books out of a PCO course up there on 16-inch guns. There are not any. I did not go to any school or anything that gives me an input on what 16-inch gunnery is all about. I got it from what I read from books. There is nothing that the XO went to, the weapons officer or otherwise. There is no schooling for these chiefs. They throw them out there without the proper training. There has got to be some kind of inroute training for these people.

Are those your words?

Captain MOOSALLY. Yes, sir.

Chairman NUNN. You still feel that way?

Captain MOOSALLY. Pretty much, yes, sir. I think there needs to be some kind of pipeline training for officers going to battleships, especially a weapons officer.

Chairman NUNN. So, basically you are saying that as captain of the ship when you came on board you had not nearly enough gunnersmates. You did not have the right billets, and most of the people there had not gone through any kind of formal training, so it was up to you to do all the training, is that right?

Captain MOOSALLY. That is correct, yes, sir.

Chairman NUNN. So, all the training on battleships is having to be done there, on the ship?

Captain MOOSALLY. All except for a C school out in San Diego, which is a paper course, an administrator course, which is given to lower rated personnel, mostly third class petty officers coming out of the gunnersmate A school. They then go to the C school for a few weeks, but there is no hands-on training. It is basically a paper course. There are no mock-ups or visits to the ships.

Chairman NUNN. And you believe that ought to be corrected?

Captain MOOSALLY. Yes, sir. I think that the chief petty officer should have some kind of enroute training. I think myself as the CO and certainly the weapons officer ought to have some enroute training to be introduced to the 16-inch gun.

Chairman NUNN. You went on to say,

> People have lost interest in these ships after they were initially manned, and I am rather disgusted. It is from the Type Commander. My feeling during the whole time here is if I could go away somewhere—and I have had people ripped off me to go to other ships—they think they have got too many people down there.

Captain MOOSALLY. Yes, sir.

Chairman NUNN. Tell us a little bit more.

Captain MOOSALLY. Well, I just felt that once again, I am sitting there as the CO of a battleship. I do not have a deployment. I have got manning ~~problems, and~~ I do not just want to talk about the gunnersmate rate. I had problems. I had a gap in my weapons officer billet. So, these were the kind of things that were weighing on my mind that we did not have a deployment. We had manning problems.

There was an indication that the battleship in some quarters was viewed as a money sump, as a personal sump, and as the CO of the ship I felt very strongly and even more strongly today after finishing the deployment that a battleship is a wonderful ship that we ought to have in our Navy, and those views that I gave there are as the CO.

Chairman NUNN. You went on to say,

> I have been told to keep my mouth shut as far as employment goes. When I pushed to get the ship on the deployment because I saw if I did not get one, that I would never be high on the manning priority list.

Now, you are saying you tried to get some employment plan?

Captain MOOSALLY. Yes, sir. The *Coral Sea* Battle Group was deploying in May 1989, and I was trying to get the *Iowa* into that battle group because of what I thought was a good concept, that the *Iowa* was a very good complement to the *Coral Sea* Air Wing, and *Coral Sea* Battle Group, so I pushed to get into that battle group, and I was told not to do that.

Chairman NUNN. Did you have a feeling that the battleships were just not a part of the Navy plan? Is that what you are basically saying?

Captain MOOSALLY. Well, I had a feeling that they were not part of a concept of operations in an employment plan.

Chairman NUNN. You went on to say——

Captain MOOSALLY. Now, let me caveat that by saying, I am just talking about the east coast. On the west coast battleships, they have a regular employment schedule over there. And I cannot talk to that—so I am just talking about the east coast here.

Chairman NUNN. We have got two on the east coast?

Captain MOOSALLY. Yes, sir.

Chairman NUNN. What is the other one on the east coast?

Captain MOOSALLY. The *Wisconsin.*

Chairman NUNN. And which two are on the west coast?

Captain MOOSALLY. *Missouri* and *New Jersey.*

Chairman NUNN. You went on to say,

> I addressed the overall quality of the wardroom as a whole with the placement officer many times, and directly to Admiral Borda, because I am concerned then and I am concerned now with the type of officers I am getting.

Do you mean that you were not getting the kind of officers that you needed?

Captain MOOSALLY. Well, that is a tough issue. That one issue in that testimony there is the one that hurt me, hurt my wardroom and hurt my ship more than anything else that has been revealed. And I really do not want to discuss specifics about the wardroom and personalities here.

Let me say that——

Chairman NUNN. I will not get into names, I just want to get a general description.

Captain MOOSALLY. Yes, sir.

Well, the general problem was, when I got to the ship, coincident with my relief, there was a relief of the weapons officer. Myself and my predecessor decided that the incoming weapons officer did not have the qualifications. So we then had to accept a gap in the weapons officer billet.

We had trouble getting a relief. And I wanted to get a relief in there as soon as I could. I think I ended up getting a relief in August—this was in May—from May until the end of August we had a gap in the weapons officer billet.

And then the gunnery officer broke his shoulder, so then I had a gap in the gunnery officer.

And it seemed like we had a hard time getting people in there to fill key billets, especially in the weapons department.

We have a mix of officers from various backgrounds. I am very happy with the wardroom I have today. So I think that we do not have that problem, but I was more concerned about the gaps in the billets and the fact that we seemed to have a hard time coming up with relief for people.

Chairman NUNN. You went on to say, quoting again:

> I will tell you the message I am getting from the Navy hierarchy is that we can straighten these guys out, but we are kicking some of these people out of the Navy, which I have kicked over, I think, in the hundreds out since I have been there. I have got guys that were dopers, marginal, per--constant UAs. I have not been easy on these guys.

Captain MOOSALLY. Yes, sir. When I came to the *Iowa* we were averaging about 25 to 30 UA's a day.

Chairman NUNN. UAs is unauthorized absence?

Captain MOOSALLY. Unauthorized absentees.

Chairman NUNN. Twenty or 30 per day?

Captain MOOSALLY. Twenty to 30 a day.

I was not happy with the standard that had been set on *Iowa*—standards in a lot of areas. I was not happy with the standards in the area of discipline. When I started taking people to mast, I was going through records and found people who had multiple infractions or disciplinary problems. People I thought should not have been continued on in the Navy, were continued, so I started cleaning those people out.

As I have said, those conditions do not exist today. As a matter of fact, our drug cases went from a level which I really cannot determine—I am just looking at a graph in my head—down to zero.

So my point was that there are some people you cannot turn around. After the second or third time, then they have got to go.

Chairman NUNN. And you were getting rid of them, right?

Captain MOOSALLY. I was getting rid of them. They were the ones that I thought were no longer going to be useful to the ship. And once again, the UA rate, I got that back by holding mast every day. Every day I had captain's mast. And that went from 25 to 30 people a day down to 10, and at times, below that.

So I just did not like the standards that had been on board as far as discipline went.

Chairman NUNN. Were a lot of your unauthorized absences caused by drug abuse?

Captain MOOSALLY. No. They were just guys who did not want to show up for work on time, basically.

Chairman NUNN. The response you got back, I guess, was reflected in this quote,

> I get the sense from the traffic from the fleet commander, the type commander, that hey, we have got to do a better job, because we are losing too many guys, and you better keep some of those jerks around because you can straighten them out if you are a good leader.

Captain MOOSALLY. Well, yes, sir. We are losing, I think, one out of three people before their enlistment is up. And the idea is to keep—you know, the more you lose, of course, the more you have got to assess. And these people, some of them are trained, and it is a problem.

I think that we are keeping those that we can turn around. We make attempts to turn people around, but when——

Chairman NUNN. But your fleet commander is basically saying you are kicking too many out and you need the people?

Captain MOOSALLY. Well, that is right. Our attrition rate is too high. And, like I said, one out of every three is too high.

Chairman NUNN. But, as a captain of a ship, it is better to have too high an attrition rate than it is to keep people that cannot do the job, is it not?

Captain MOOSALLY. In my opinion, yes, sir.

Chairman NUNN. You went on to say, quoting you:

> At the rate I am going right now, I will have a 48 percent turnover in my crew this year. I think this is a major detractor, and I have said this on the record to my boss, of crew instability and training. I will say it again in very strong terms that I think the battleship has not been properly taken care of as far as manning goes, in the wardroom or the enlisted area.

Captain MOOSALLY. Yes, sir.

Chairman NUNN. Is that still your feeling?

Captain MOOSALLY. Not anymore. I think we have a lot of people now. Today I have eight of nine gunnersmate chiefs instead of the 1 out of 11 I had back in June 1988. We have plenty of people today.

Chairman NUNN. Now, this was given in May 1989, though?

Captain MOOSALLY. Yes, sir.

Chairman NUNN. As of that date, does that accurately reflect your opinion?

Captain MOOSALLY. Yes, sir.

Chairman NUNN. Thank you.

Senator Warner, I have gone over my time. Why don't we each take 10 minutes, and we will rotate back and forth.

Senator WARNER. Thank you, Mr. Chairman.

Well, Captain, I think you have defended your ship, crew, and the families that support men who go to sea. I think what concerns me most was one of your responses here, that had you known your statement would have gone into the public domain, you might have said something differently.

Captain MOOSALLY. Yes, sir.

Senator WARNER. Now, I view the purpose of this hearing as not to redo the job the Navy is required to do in the case of an accident, but to determine did the Navy, in an accurate, and in a fair, and in a thorough manner, bring to light every single fact that could bear upon the conclusion. Not that we agree or disagree with the Navy's conclusion, but was the procedure correct?

We have a tremendous obligation, first and foremost, to the families who lost the sailors; and I think second, to families who continue to support that ship; and the families who support sailors at sea all over the world today.

Is there any fact that you have, or that you know that someone else has, that could be brought to light that might help get a clearer picture of what happened?

Captain MOOSALLY. No, sir.

You know we have agonized, and I personally have agonized over this thing for almost 8 months now. It has been a terrible burden for us who are here carrying the load of our fallen shipmates. I mean, we grieve; the emotion is unbelievable. If there was a simple answer, I wish I had it. I have been gone for 6 months. I am not privy to a lot of things that the Navy investigation team has found out since I left the States in June.

Senator WARNER. Well, that is an important part. Why are you not privy to that? Because you might have evidence that either corroborates those facts or does not corroborate those facts.

Captain MOOSALLY. No, sir. I do not think there is any new evidence that we would have on board the ship that would corroborate anything differently.

Senator WARNER. Why would a part of this examination be withheld from your scrutiny?

Captain MOOSALLY. Well, I was part of the investigation; I was party to the investigation. I was given my rights.

Senator WARNER. I understand that. But presumably the Navy, in stating its conclusions, has divulged the pertinent facts that support those conclusions.

Captain MOOSALLY. Yes, sir.

Senator WARNER. Do you think there are some facts which have not been brought to public light?

Captain MOOSALLY. Not that I am aware of, no, sir.

Senator WARNER. Well, then, why is it that you are not privy to some of the information?

Captain MOOSALLY. Well, I am. As of the time in September, just before the investigation was released, I was given a copy of parts of the investigation report, and I have read that. But all the other detailed lab reports, the forensic reports and things of that nature, I am not.

Senator WARNER. Wait a minute, you are not what?

Captain MOOSALLY. I have not read those documents.

Senator WARNER. Well, are they being withheld from you?

Captain MOOSALLY. No, I have not asked for them.

Senator WARNER. So, in other words, you do have access to any of the facts?

Captain MOOSALLY. Yes, I think I do. Yes.

Senator WARNER. Well, somehow I think that is different than what you initially said.

Captain MOOSALLY. I think what I initially said was that, up through September, I had not been given—my first look at the investigation report was 2 days before its release.

Senator WARNER. Do you think the Navy's examination of this tragedy was accurate and fair, and was done in a spirit which brought forth all the facts, irrespective of the conclusions? Did the procedure itself develop the factual base on which, presumably, reasonable men and women could reach a just conclusion?

You are the Captain of the ship; in your judgment was the procedure followed by the Navy fair? Was it accurate and thorough?

Captain MOOSALLY. I think, generally speaking, yes. There are facts with regard to shipboard deficiencies, findings of fact, which I do not agree with.

Senator WARNER. Facts, but I am now asking about the procedure which the Navy has followed.

Captain MOOSALLY. As far as I can tell, yes, sir. As far as I can tell, the procedures have been correct.

Senator WARNER. And you know of no other facts that you think should be brought forth and made public at this time?

Captain MOOSALLY. Not that I am aware of, no, sir.

Senator WARNER. Do you know of any other person that has facts that could be——

Captain MOOSALLY. No, sir, I do not.

Senator WARNER. Much has been said about this ship being 37th on a priority list. What is the total number on any such list? Is it the 560-plus ships that are active in the fleet today?

Captain MOOSALLY. Yes, sir.

Senator WARNER. Thirty-seven, in terms of 560, seems pretty high.

Captain MOOSALLY. Well, it is not high if you are not going to—I mean it is a relative number, and if you do not get anybody with any number, it does not make any difference.

Senator WARNER. Well, do you feel that your ship was singled out unfairly, or is this a problem that is endemic to the entire Navy, the shortages in manning billets?

Captain MOOSALLY. There are some shortages. My point on the manning issue was I needed some petty officers, senior petty officers, to be supervisors on my ship and, as I said, when I came to that ship, I had one chief petty officer assigned all three turrets.

Senator WARNER. It is clear that you had a deficiency. I am just trying to compare your ship against say, the other three battleships and other ships in the fleet. Were you singled out, do you think, in any way in terms of manning shortages?

Captain MOOSALLY. No, sir, I do not think I was singled out. I think—you know, I do not know what went through the manning authority's mind. I do not know how the priorities were set. I cannot answer that question.

Senator WARNER. I yield at this point to other members, but I would like to come back.

Chairman NUNN. Thank you. Surely you will have an opportunity. Senator Dixon.

Senator DIXON. Captain Moosally, let me say first of all that I have carefully read your statement given on a prior occasion when this investigation was taking place. I think it is a completely truthful and straightforward statement that addresses the concerns as you saw them as captain of that ship. Everything that I've read and everything I've inquired about concerning your command of that ship and your entire record thoroughly convinces me that you are a first class officer in every way and that you did exactly what you should have done in every instance as captain of that ship. I want to make that perfectly clear. No question that I ask you is directed against you as an individual. It is a question designed to search for the truth.

Those questions the chairman has previously asked are questions I had already underlined and would have asked myself concerning matters that you brought up in your statement.

One thing that stands out to me is your statement already brought to the attention of the public by the Chair that there really has been no training for the handling of these 16-inch guns in the Navy. I take it that it is the responsibility, of course, on every ship to do the best that one can to develop the kind of hands-on training that is required by both officers and crew, to handle these guns.

But I would again ask for the record, in fact, there is no true hands-on school training for the handling of these 16-inch guns right now or there has not been up until the occasion of what happen on the *Iowa*.

Captain MOOSALLY. The only hands-on training is aboard the ship.

Senator DIXON. I ask this to you as a layperson, but it occurs to me that this is an exceedingly cumbersome and relatively dangerous type of operation in the first instance. These big powder bags and all of the things attendant upon the firing of the 16-inch gun. For a layperson, I understand that you have special expertise. Would you concede that is the case?

Captain MOOSALLY. No.

Senator DIXON. You do not think it is especially dangerous?

Captain MOOSALLY. No. I think that the 16-inch gun system is a very simple system. Most of the jobs down there, the billets down there, are mule hauling-type jobs loading powders, and there's very few skilled positions in that turret. That gun is one of the safest guns ever built, and I could read you a list of safety interlocks and safety devices which are comparable to those found in a nuclear power plant.

The people who designed that thing in the thirties were, I think, geniuses.

Senator DIXON. Let me ask you this. Did you have some concern about the powder?

Captain MOOSALLY. No.

Senator DIXON. Well, in the report you say the Yorktown message, the Yorktown is where the powder bags were kept on covered barges. You say on the powder,

> I mean, I don't have a lot of faith after reading the OP—

That is the ordnance publication—

> that the powder is very good.

Captain MOOSALLY. Oh, you are talking about the powder that was on the barges then? The powder that was on the barges I had a concern about because it had been improperly stowed for 3 months. Yes, I had a concern for that, yes, sir.

Senator DIXON. And did you have a concern again in the same way that the chairman handled this? I will not deal in names, but did you have a concern about those who had been given the responsibility in connection with the operation of these guns?

Captain MOOSALLY. No. No, because I think the people we had were well trained people, so I had complete confidence, and everybody that has come on that ship has told me the same thing.

Senator DIXON. Well, there is this statement of yours.

> So, all these things are coming together. That is when the Admiral called me and said, "X really wants to get out of what he is doing. He is good at what he does. He is never going to be a superstar, but he is good at being a gunnery officer," so I accepted him.

Captain MOOSALLY. Right.

Senator DIXON [reading]:

> I got to tell you, looking back on it, I do not know what X has told you, but X is a basket case right now. He completely collapsed on me during this whole thing. He had to see a psychiatrist. On the way back, he was totally useless. I think to this day whatever the outcome of this thing, he would have a hard time continuing on with his job. I do not have any confidence in him because of his mental state. I mean, if you asked X if he killed his mother right now, he would say yes, I did. So, he came on board, and I have addressed the wardroom issue to the Admiral in a letter, the whole wardroom issue.

Well, that does not sound like a very good gunnery officer to me?

Captain MOOSALLY. No, sir.

Senator DIXON. Now, what about the chief, the master chief, without mentioning his name—and I quote about him.

> I think he belongs in a laboratory somewhere. He drives me nuts. I can only stand to spend about 5 minutes with him. I think he could be a loose cannon.

Captain MOOSALLY. Yes, sir. That individual in my book is one of the best and most knowledgeable people on 16-inch gun systems. He does have to be kept in a box. But having said that, he is very useful, and I do not know what I would have done without him on this deployment.

Senator DIXON. Well, again, in fairness to you, you did not pick these men. I am not saying that. I am asking about the facts as they existed on the *Iowa*.

Now, is it not a fact that you were 36 gunnersmates short?

Captain MOOSALLY. I think I said 37.

Senator DIXON. I apologize, 37. And did you say that on turret III there was a mess, hydraulic leaks all over the place, lighting that did not work. They had 25 watt bulbs in because they were afraid they would blow fuses at the 50 watt level?

Captain MOOSALLY. Yes, sir, those are the conditions that I found when I came aboard the *Iowa*. As I said, those conditions do not exist today. They did not exist on April 19. We fixed those things.

Senator DIXON. Did you indicate that you addressed the overall quality of the wardroom as a whole with the placement officer many times and directly to the Admiral, "because I was concerned then and am concerned now with the type of officers I am getting."

Captain MOOSALLY. Yes, sir. I talked to the placement officer, as I said in the statement to Admiral Borda, about the overall quality in the wardroom, but I do not know what the point is.

Senator DIXON. Well, may I ask another question on another issue. Was there a misfire in turret I?

Captain MOOSALLY. On April 19? Yes, sir, there was.

Senator DIXON. Just for the record, my understanding, which is limited on the subject because obviously it is not a thing on which I pretend to have any particular expertise, is that the history of the situation is that from time to time there are accidents with respect to these guns, are there not?

Captain MOOSALLY. No. On the *Iowa*-class battleships there have been 22,000 rounds shot, since their commissioning, and there has not been one accident before the *Iowa*.

Senator DIXON. Well, what was the nature of the misfiring in turret I?

Captain MOOSALLY. We have misfires on ships. We had a misfire when GAO was out there. Sometimes the primer does not fire, and we do not know actually what happened in this case. Sometimes on reduced charges, which was in turret I the bag sags, and you do not get the bag coming up against the firing pin. But it is not something that you need to be overly concerned about. I mean, you have to follow the proper procedures, but it happens. That is why we have nine guns. You go on to the next gun.

Senator DIXON. Now, speaking about those bags, on page 19 I read to you from the inquiry.

> *Question.* So, when you were briefed verbally at the time you saw the firing plan?
> Answer. I was not briefed that it was going to be five bags reduced charge.
>
> *Question.* Would it surprise you to learn that they intended to fire turret III with four bags of powder?
>
> Answer. Very surprising, very alarming.
>
> *Question.* There has been more than one bit of testimony that would indicate that was the plan. Have you been made aware of that now?
>
> Answer. Yes, sir.

Now, why would that be alarming?

Captain MOOSALLY. It is alarming because to break out powders, you have to have my permission. The CO has to give his permission to break out powders in the magazine, and the fact that I had not approved turret III to fire and turret III was not going to fire, so they should have never broken anything out.

Senator DIXON. As a matter of fact, on the morning in question Hartwig was not even listed on your operations schedule for that day as the gunnery captain, was he?

Captain MOOSALLY. No, sir.

Senator DIXON. Who was?

Captain MOOSALLY. I think it was Petty Officer Lawrence, who was going to shoot to get his final qualification. Part of the qualification——

Senator DIXON. If I may interrupt, is it not a fact that Lawrence was not fully qualified?

Captain MOOSALLY. You can interrupt, but the final qualification on many of these jobs is to actually do the task, and to get the final qualification he was supposed to have fired the gun.

Senator DIXON. There was no problem in your eyes with Lawrence being the man to fire the gun that day?

Captain MOOSALLY. No, sir.

Senator DIXON. He was scheduled to do it?

Captain MOOSALLY. Yes, sir.

Senator DIXON. If you know, when did that change? Do you know?

Captain MOOSALLY. Well, I cannot know everything but I have a good feeling what changed. We had a couple of unauthorized absentees, and we had to fill in some spots. Petty Officer Hartwig ended up filling in as the gun captain.

Senator DIXON. So at that moment he may have filled in?

Captain MOOSALLY. It is my belief that he was in the turret at the time of the explosion as the gun captain.

Senator DIXON. But the point is at that moment he may have filled in for Lawrence with no prescheduling of the event at all?

Captain MOOSALLY. I cannot say that.

Senator DIXON. But it could have happened?

Captain MOOSALLY. We had been under way for a number of days, and I am sure it was known who the absentees were. I cannot tell you when in time the senior chief——

Senator DIXON. But the schedule for that day showed Lawrence——

Captain MOOSALLY. No, sir. That watch bill was not made up on that day. That watch bill was made up before we got under way.

Senator DIXON. That day it was to be Lawrence?

Captain MOOSALLY. Originally it was to be Lawrence.

Senator DIXON. But as far as you know, nothing was done at your level or through your command and there is no paper trail to show a change from Lawrence to Hartwig?

Captain MOOSALLY. No, and I would not expect any.

Senator DIXON. So that Hartwig could have gone in there almost at the precise moment that the drill was to take place?

Captain MOOSALLY. I doubt it.

Senator DIXON. But it is possible?

Captain MOOSALLY. Yes, sir, it is possible, but I doubt it seriously.

Chairman NUNN. Senator Cohen.

Senator COHEN. Just a few questions, Mr. Chairman.

Captain, you were asked earlier if you would characterize your earlier testimony, your private statement, differently had you known it would be made public?

Captain MOOSALLY. Yes, sir.

Senator COHEN. The question I have is, was it a question of language or substance that you would change?

Captain MOOSALLY. I would change the language. I would have protected people who I think got hurt by making my statement public. I certainly would have changed my language. Had it not been under the circumstances of my being under a very stressful, emotional period, I think I overstated myself in some areas.

So yes, I would have definitely not said things in the context in which they were said in that statement. If I could have retracted a lot of those things and the hurt they gave some of the people, especially in my wardroom, I would not have said them.

Senator COHEN. Was it a situation in which you were angry perhaps that you were put in charge of a ship on which you saw clear deficiencies?

Captain MOOSALLY. I would state that I felt like the good Lord in the Garden of Gethsemani when I looked around and saw the various problems that I was facing materielwise and some of the standards in training. If you go through my written statement I submitted to the investigating office, I had trouble in the engineering department. I had an engineering officer quit on me. I had to relieve my damage control assistant because of the poor training that I found there.

So it was a ship on which I had my work cut out for me. Plus, before I got to the ship I knew that *Iowa* had been found not fit for service in 1986 because of the failure to pass the INSURV inspection. So my goal was to get the ship in shape to pass INSURV, and in the process, of course, we did that, and we did it in fine fashion.

Senator COHEN. Basically, the language that you used in your statement reflected the obvious sense of, I would say, anger——

Captain MOOSALLY. Yes, sir.

Senator COHEN [continuing]. That you are put on a ship, you are out there, you are on duty.

Captain MOOSALLY. It was anger and the stress. Like I said, the 47—no commanding officer wants to lose a man on any ship, and to lose 47 men in such a tragic explosion is devastating; and then to be given your Article 31 rights and to be accused of dereliction of duty after all the things that you had done to make this ship one of the best in the Navy really hurts; and you do become angry, yes, sir.

Senator COHEN. So when you were asked the question about the gunnery officer, in essence you said he was unfit?

Captain MOOSALLY. Well, once again, everybody will basically know who the gunnery officer was. He had tremendous emotional problems after the explosion. He could not cope, and that is why I suggested that we needed to get him off the ship.

Senator COHEN. I think you referred to one of the mates as needing to be kept in a box?

Captain MOOSALLY. Right, our master fire control gunner. If you keep him in the box, he is a heck of an asset. I would go to war with him anytime.

Senator COHEN. What do you mean by that?

Captain MOOSALLY. He is an expert on putting ordnance on target, and this is one of the reasons *Iowa*——

Senator COHEN. I meant by keeping him in the box.

Captain MOOSALLY. Well, he likes to push the system to the maximum extent that he can. I am not saying he wants to do anything unsafe. He just likes to exercise the system in every aspect of which it is capable.

Senator COHEN. Captain, there was a report that the battleship did not fire accurately off Lebanon a few years ago. What was the problem then?

Captain MOOSALLY. I can only say what I know. It was the *New Jersey.* They had problems putting ordnance on target because of spotter problems, chart problems and so forth. This is really the genesis of why *Iowa* had a close relationship with the field activities of NAVSEA, Dahlgren and so forth. *Iowa* came back in 1984 and conducted a series of firing tests down at Vieques to prove the accuracy of the 16-inch gun and did very well. There is a report on this subject. That is basically the genesis of this close relationship between Dahlgren, NAVSEA and the *Iowa.*

Senator COHEN. Senator Warner asked you a question as to whether you felt the Navy's investigation of the procedures instituted by the Navy for their investigation were fair, accurate and thorough, and you said yes but that you disagreed with some of the facts.

Would you just explain whether you meant facts or conclusions or both? I did not hear your earlier testimony.

Captain MOOSALLY. I disagree with some of the findings of fact with regard to shipboard deficiencies. There are a number with which I disagree.

The thing that I think may be missing here is that this was an informal JAG investigation. It is basically one man's opinion.

Senator COHEN. Was that a fair procedure?

Captain MOOSALLY. Well, I would like to have had the opportunity to comment on some of their findings of fact, and I did not get that opportunity.

Senator COHEN. How do you characterize procedures being fair, then?

Captain MOOSALLY. That is the way we do business. I think it was fair in the context of the way we do business as far as JAG investigations go.

Senator COHEN. Do you think the way you do business is fair?

Captain MOOSALLY. Well, I will say that the ship was not given a fair shake in commenting on findings of fact with regard to shipboard deficiencies.

Senator COHEN. If you have an investigation that is under way and you have procedures which are instituted and you do not have an opportunity to comment, that procedure can be characterized as being Navy but can it be characterized as being fair?

Captain MOOSALLY. I do not know, sir.

Senator COHEN. Were there any other conclusions with which you disagreed in the Navy's investigation?

Captain MOOSALLY. No, sir.

Senator COHEN. You agree with the conclusions but not the findings of fact?

Captain MOOSALLY. I believe that, for me, the only conclusion that counts is that there was a wrongful intentional act, and I agree with that conclusion. I think that is the only real major conclusion of the report that is meaningful.

Senator COHEN. Could you list for me the factual differences that you have with the Navy's investigation?

Captain MOOSALLY. I can provide those to you, sir.

[The information referred to follows:]

INTRODUCTION

The Commanding Officer, USS IOWA, has reviewed the "Investigation into the 19 April 1989 Explosion in Turret II USS IOWA (BB 61)". The attached contains his comments regarding a number of the Investigation's Findings of Fact and Opinions.

Findings of Fact ("FOF")

FOF 18: Pre pre-fire briefs are to cover exercise procedures, ammunition types to be employed, misfire/hangfire procedures, hot gun procedures, and general safety precautions dealing with magazine safety.

Comment: There is no requirement for a "pre pre-fire" brief, much less a requirement directing what subjects are to be discussed. The requirement for "pre-fire" briefs is contained in Type Commander's policy COMNAVSURFLANTINST 3500.2E, CH. 1, Paragraph 8303. Paragraph 8303 provides, "The preparation and publication of a firing plan and conduct of a prefiring conference are mandatory before all weapons firing exercises." No format for the firing plans or pre-fire conference is specified by COMNAVSURFLANTINST 3500.2E, paragraph 8303, and there is no requirement for what subjects are to be discussed during the pre-fire conference. IOWA briefs her personnel at a pre pre-fire brief and then again at a pre-fire brief where the key personnel are again briefed along with CO, XO, and Bridge personnel. These key personnel then brief their individual crews so that all personnel are briefed. All of the subjects referenced in FOF 18 were covered in the pre-fire briefings and subsequent briefings of the individual crews.

FOF 19: **Weapons Department policy required all gunnery, fire control, ammunition handling teams, and control personnel to attend pre-pre-fire briefs.**

Comment: There was no written IOWA or Weapons Department policy on 19 April that specified which personnel were required to attend pre-fire or pre pre-fire briefs or who was to attend. Historically, personnel directly involved in the exercise, i.e., Turret Officers, Turret Captains, Gun Captains and Petty Officers in charge of various areas (Powder Flats, Magazines, etc.) attended these briefs. Additionally, all other Turret Crew members could attend, but no requirement was ever levied. Only about 15 positions in each Turret, including six from Fire Control and two from Gun Control Stations could be considered critical and require a formal pre pre-fire briefing. Only the Turret Officer, Turret Captain, Gun Captain and Rammerman are involved in Misfire Procedures. Today on IOWA, only the critical positions are briefed at a formal pre pre-fire brief. They in turn brief their individual crews so that all personnel are briefed. This same procedure was done for the 19 April firings. It worked before and it still works.

FOF 20: If all personnel assigned to the above positions had attended the 18 April 1989 pre pre-fire brief, the actual number of service members in attendance would have exceeded 100.

Comment: See comment to FOF 19. In addition, IOWA found that trying to do a pre-fire brief for up to 300 crew members (3 Turrets) was inefficient and ineffective. A smaller pre pre-fire brief for critical billet personnel with a follow-on brief on station for remaining Turret personnel when Gun Quarters/GQ is set is the most effective method of briefing safety, exercise conduct and misfire procedures. The fact that the additional personnel (non-critical) attend pre pre-fire briefs and are again briefed on station only further demonstrates IOWA's dedication to safe weapons firings.

FOF 21: **IOWA procedures did not ensure safety briefs were systematically conducted with all Main Battery personnel for gunnery exercises.**

Comment: To the contrary, IOWA's safety briefs were systematically conducted with all Main Battery personnel for all gunnery exercises. Prior to any gunshoot aboard USS IOWA, including that on 19 April 1989, the following on-station briefs are given:

A. Gun Captain - Assures range, checksight and firing zone are clear; assures positive communication with all stations (Batteries released criteria). Assures all personnel are in battle dress. Assures emergency egress is clear and that all fire fighting equipment is operative. Also covers broken powder bag, smoking powder bag, misfire,fuze setting and general safety procedures and takes muster. Assures ZEBRA is set in his area.

B. Petty Officer in Charge of Projectile Decks - Assures personnel are in battle dress. Assures that emergency egress is clear and that fire fighting equipment is operative. Covers smoking powder bag, fouled parbuckler, toppled projectile and general safety procedures and takes muster. Assures ZEBRA is set in his area.

C. Petty Officer in Charge of Powder Flats - Assures personnel are in battle dress. Assures that emergency egress is clear and that fire fighting equipment is operative. Covers powder passing, broken powder bag, smoking powder bag and general safety procedures and takes muster. Assures ZEBRA is set in his area.

D. Petty Officer in Charge of Annular Space - Assures personnel are in battle dress. Assures emergency egress is clear and that fire fighting equipment is operative. Covers broken powder bag, smoking powder bag, and general safety procedures. Assures annunciator, gas ejection and magazine sprinkler valves are operative and takes muster. Assures ZEBRA is set in his area.

E. Magazine Supervisor - Assures personnel are in battle dress. Assures that emergency egress is clear and that fire fighting equipment is operative. Covers broken powder bag and general safety procedures. Assures annunciator is operative and takes muster. Assures ZEBRA is set in his area.

When the foregoing briefs are completed, the responsible petty officer then reports he is "manned and ready."

FOF 24: At the pre pre-fire brief, personnel were not mustered, but approximately 40 servicemembers attended.

Comment: **No muster reports for pre pre-fire conferences are required.** For a discussion of IOWA's method of conducting pre-fire briefs, see comments to FOFs 18-21.

FOF 37: After reloading center and right guns, personnel in Turret I again attempted to fire left gun. A second misfire occurred. Center and Right gun then fired one round sequentially. Left gun was reprimed, superelevated, and returned to target elevation for the second time and misfired for a third time. The firing sequence proceeded to Turret II. **Exact times for Turret I firing sequence was not recorded**.

Comment: **There is no requirement in any instruction or publication to record the time that each round is fired or an attempt to fire is made, unless a misfire occurs**. When a misfire occurs, Gun Control, Gun Plot and the Turret Officer note the time of misfire to determine safe time for carrying out misfire procedures. No purpose would be served to record each time a gun is fired except for misfires. IOWA noted the times of the misfires referenced in FOF 37.

FOF 70: Operating directives indicate lead foil, used as a decoppering agent, are to be removed from the rough silk envelopes in which they are packaged and inserted between the first and second powder bags prior to each gun firing. The general practice on board IOWA, however, was to leave the lead foil in their silk envelopes. Moreover, IOWA Main Battery gun captains did not uniformly place the lead foil in its proper position or use lead foil patches for each firing. Nevertheless, lead foil had been inserted in center gun Turret II prior to detonation on 19 April 1989.

Comment: NAVSEA Ordnance Publication SW 30-AA-MMO-010 Pg 3-51 states that lead foil should be removed from silk envelopes. This procedure has no relationship to any safety issue. The silk bag on the lead foils is designed to burn up during firing which will leave no residue. **Lead foils have no relationship whatsoever to ordnance safety but are strictly used as a decoppering agent in the gun**. The SWOP also states that the lead foil should be placed **within** the first or second section of powder **not** between the first and second bag as stated in FOF. Additionally, the publication states that if the flashless feature of the powder is desired, the use of the lead foil is left to the discretion of the Fleet.

FOF 83: Although undated, enclosure (106) (Turret II Battle Bill) was distributed prior to the explosion. Such documents are not formally promulgated Weapons Department watchbills. Rather, they are documents initiated and distributed by Turret Officers to notify turret personnel of assigned stations. No other written Turret II station assignments were presented to or found by the investigation officer.

Comment: There is no requirement for a formal watchbill for Turret firings. Watchbill assignments are fluid based on qualified personnel availability due to Gunner's Mates (GMG) personnel shortages and Under Instruction (U/I) training requirements for PQS signoffs. In addition, **Watchbills are not required to be signed by the Weapons Officer by any Navy Instruction.**

FOF 139: **On 19 April 1989, remote operation of Turret II hydraulic sprinkler system was not possible from Turret I annular space. Similarly, the Center Gun Turret II Powder Hoist had to be stopped manually vice automatically as designed and as possible in both right and left gun powder hoists.** Although these discrepancies existed for an indeterminate but lengthy period prior to 19 April, no CASREPS were submitted.

Comment: a. **There is no indication from any source that the remote operation of Turret II hydraulic system was not possible from Turret I prior to the explosion. The testimony of GMG1 Mortensen (Turret I LPO) stated he had no problem with sprinkler system activations until the explosion**. (FOF 140 substantiates the operation). If there was a failure caused by the explosion, Turret II system could still be activated remotely from DC Central and Turret II annular space.

b. **The discrepancy with Center Powder Hoist in Turret II is unsubstantiated**. **The discrepancy was reported by a Seaman "SN" who heard it from another SN, neither who worked in the turret**. No one in the Weapons Chain of Command was aware of any problem with the Center powder hoist. Likewise, the INSURV Inspection conducted in March 1989 found no such discrepancy. Turret II personnel had been adjusting powder hoist safety latches the night before the explosion, but this did not affect operation of the powder hoist.

FOF 143: **Post-incident inspection of Turret II indicates Material Condition Zebra was not uniformly set throughout the Turret.**

Comment: **Zebra was reported set prior to commencement of exercise in Turret II. One of Turret II survivors, YN3 Marshall, reports that Zebra was set in the Turret on April 19th. The FOF was based on a statement by LT ROPER of the Investigation Team who toured the Turret 2 days after the accident. This tour was the basis of his conclusion.** During the post explosion damage control efforts, Zebra was broken throughout the Turret. This FOF is pure speculation.

FOF 146/
Opinion
13)c)/18: The Turret II intraturret sprinkler system was not, as a matter of practice, charged by Turret II personnel during gun operations.

Comment: **The charging of the Turret II intrasprinkler system hose or any Turret intrasprinkler hose was and is a trip safety hazard on the powder flats**. The position of the charged hose requires powder handlers to step over it while carrying bags of powder. IOWA brought this fact to NAVSEA's attention. NAVSEA concurred (COMNAVSEASYSCOM) 172222Z OCT 89) and is reviewing a new design to eliminate the hazard. The protection provided by the charging of the hose is minimal compared to the potential hazards it causes.

FOF 150: Numerous crew members in the initial response effort were not in full battle dress.

Comment: **This FOF has no relevancy to the investigation**. **The ship was not at General Quarters (GQ), therefore those personnel not at gun quarters would not have been in battle dress**. The initial effort was to put out fires, save lives and save the ship. The crew did not have the time to get in full battle dress prior to initial damage control response. Fire parties relieving initial response crew members were in compliance with all firefighting safety requirements.

FOF 162: Simultaneously, Repair II was manned and their fire fighting and damage control efforts commenced. **The Repair VI ordnance repair party was not manned on 19 April 1989** and as a matter of routine, is never manned during gunnery evolutions, General Quarters or not.

Comment: **In accordance with IOWA Repair Party Manual, which uses COMNAVSURFLANTINST 3541.1B as its base instruction, Repair VI is applicable only to Cruisers. Since Repair VI is not required on Battleships IAW CNSLINST, and the magazines can be remotely operated from DC Central, Repair VI was not manned**. Repair VI, when manned, works for Weapons Control and is tasked to effect repairs to electrical and sound powered telephones, render first aid, transport personnel to battle dressing stations, and control and extinguish fires as directed. Additionally, Repair VI personnel are tasked to make emergency ordnance repairs, assist repair parties and operate magazine sprinkler systems and other ordnance systems.

On 19 April IOWA did not have the senior ordnance personnel to man Repair VI. Shortages of GMG's required that experienced personnel man the Turrets vice Repair VI. Ordnance Repair is done by a senior GMG stationed in each Turret. Naval Warfare Publication (NWP) 62 states that in combatants not using Repair VI, ordnance repair is done by the teams within the Combat Systems Casualty Control Organization as is done on IOWA. With the manning levels of GMG's now approaching Ship Manning Document (SMD), a Repair VI organization has been implemented on IOWA.

FOF 186: Once final PQS qualification has been achieved, Division Officers are responsible for ensuring that appropriate entries in members' service records Page 4 (NAVPERS 1070/604) are made to reflect final qualification.

Comment: This statement creates the false impression that Division Officers have an obligation to assure that page 4 entries are made as soon as PQS qualifications are completed. In fact, such entries need be made only upon transfer of the individual from his command. Until that time, it is perfectly proper and ordinary to record final qualifications in divisional records. Even worse, this statement is used subsequently to imply that the absence of a page 4 entry means that the individual was not qualified for a particular task.

FOF 190: The COMNAVSURFLANT Combat System Mobile Training Team (CSMTT) conducted a Combat Systems Assessment (CSA) in IOWA during March 1989 in conjunction with Tomahawk/Harpoon Cruise Missile Tactical Qualification. A CSA is a one day "snapshot" of Combat Systems Readiness and includes a PQS review covering PQS administration and a spot check of watch station qualification progress. The PQS review conducted as a part of the CSA in IOWA was evaluated as satisfactory, but did not include the 16" turrets as part of a spot check of watch station qualifications.

Comment: This statement is misleading because it omits three crucial facts. First, the Commanding Officer, USS IOWA was informed by the CSA inspectors that all IOWA's weapons PQS was in good shape. Second, the inspection was supposed to cover the 16" turrets as is shown by the statements of the inspectors, each of whom thought someone else was responsible for the turrets. Third, reviewing a battleship's weapons PQS and not looking at the 16" turrets is like going to Niagara and not looking at the falls. You can do it, but you're missing the point.

FOF 191: There were three methods of watchstation "qualification" being employed in IOWA's Main Battery turrets prior to 19 April 1989:

a. The under instruction watchstander was allowed to perform the duties of the new watch station under the direct supervision of a qualified watchstander in the space for the sole purpose of observing the under instruction watchstander.

b. The under instruction watchstander was allowed to perform the duties of the new watch station under the supervision of a qualified watchstander. However, the qualified watchstander was not in the space solely to observe the under instruction watchstander. The qualified watchstander would also perform duties at another watch station in close proximity to the under instruction watchstander.

c. A de facto qualification procedure was conducted in each turret whereby a training and qualification process was implemented independent from strict PQS standards and compliance. An individual was characterized as "qualified" (i.e. capable of performing the assigned task) if he could demonstrate sufficient operational skill to perform the duties of the watch station to the satisfaction of a qualified watchstander.

Comment: The methods of watchstation qualification employed in IOWA's Main Battery Turrets prior to 19 April were valid. Most servicemembers obtain training and become PQS qualified by performing a job under the supervision of a previously trained and qualified member. Nowhere does Navy policy state that the qualifier cannot be engaged in other work at the same time. Indeed, in tight spaces such as the gun rooms, the only way a qualifier can be present is if he is filling one of the other positions. FOF 191 attempts to discredit this means of qualifying a member by lumping it together with a plainly invalid method, which is described in subparagraph C. as being used "in each turret." The implication is that this "de facto" procedure was generally recognized and accepted throughout the ship. This conclusion is not supported by the cited enclosures nor is it true. IOWA's method of qualification used the supervision of a qualifier in another position. This is a valid and proper method to qualify gun crews.

FOF 193: Only thirteen (13) of fifty-one (51) watch stations actually manned in Turret II requiring formal PQS qualification were filled with PQS qualified personnel at the time of the 19 April 1989 explosion in Turret II. There were some personnel assigned to watch stations in Turret II whose PQS books could not be obtained. These books were either destroyed by fire, never existed, or have not been located. accordingly, if no PQS book was found for a deceased service member, findings are based exclusively on service record page four entries.

Comment: This extremely misleading FOF is based on two previously discussed false premises. First, there is no requirement that page 4 entries record PQS qualifications until the individual is detached from his command. Second, there is nothing improper about having a person who is working on his PQS filling a position under the instruction of a qualifier. However, by disregarding these facts and listing as qualified only those individuals whose records survived the explosion and who were not learning a new position, the FOF gives the impression that most of the turret was unqualified, untrained, and unsafe -- an impression which is demonstrably not true. The FOF is also contrary to statements made to me by members of five different inspection teams, both immediately prior to and after 19 April, including a statement made by Mr. Robert Stilson, head of the Explosives Safety Review Team, that none of the records he examined in depth for Turret 2 had any deficiencies in their certification program for non-nuclear ordnance. Finally, the FOF is contrary to my personal observations.

FOF 196: Applicable Navy directives indicate a Chief Gunner's Mate (Guns) is the appropriate rate to fill the Main Battery Turret Captain station. On 19 April 1989, GMG2 Keerl was Turret I's Turret Captain with GMG3 Cline serving under instruction.

Comment: There is no requirement that this station be filled with a Chief Gunner's Mate. Due to the shortage of Chief Petty Officers on board IOWA during this time, I used GMG2 Keerl as Turret I's Captain. There is nothing improper about having an outstanding, experienced, fully-qualified petty officer such as GMG2 Keerl as Turret Captain. No evidence of any kind exists to show that he performed in less than a superlative manner both before and after the mishap. FOF 196 is a gratuitous slap at a fine petty officer and has no bearing whatsoever on the Turret II explosion. Petty Officer Keerl, though not a Chief Petty Officer, was the best, most qualified man for the position, period.

FOF 198: In IOWA, Ensigns and Lieutenants (junior grade) served as Weapons Department Division Officers. In fact, ENS Garrett, who had been on board IOWA for only sixteen (16) days, was the only officer in Turret I on 19 April 1989. The G-1 Division Officer, (LTJG Meyer), who normally acts as the Turret Officer for Turret I, was standing the Junior Officer of the Deck watch on the bridge. ENS Garrett was not familiar with turret operations, safety, misfire or hangfire procedures.

Comment: This FOF falsely creates the impression that a brand new Ensign was running Turret I. There is no requirement that the Turret Officer be a commissioned officer. As the investigator knew perfectly well, GMG1 Mortensen, one the finest and most experienced gunner's mates in the fleet, was serving as Turret Officer and Ensign Garrett was there to learn and observe. The statement that he was not familiar with safety and the operation is true; that is what he was there to learn.

FOF 203: The Commanding Officer, Executive Officer, Weapons Officer and the Gunnery Officer were not aware of the current qualification status of personnel assigned to the 16"/50 caliber turrets. None were aware of the large number of watch stations being manned by personnel not qualified under the PQS program.

Comment: This statement is based on the false assumption that the current qualification status of these personnel had to be determined by whether the status was reflected in the Page 4 entries. As discussed previously in the comments of FOFs 186 and 193, there is no requirement that Page 4 entries record PQS qualifications until the individual is detached. Thus, the finding that a large number of watch stations were being manned by personnel not qualified under the PQS Program is incorrect. To the contrary, both internal and external inspections conducted prior to and after 19 April demonstrate that IOWA's personnel assigned to the 16"/50 caliber turrets were well trained in accordance with PQS requirements. Indeed, the CO, XO, WEPS and GUNS knew on the basis of constant shipboard inspections, inspection by outside agencies, and most importantly, by consistent outstanding, mishap-free firing exercises, that gun crews of IOWA had proven themselves to be the finest and best-trained gunners in the U.S. Navy.

FOF 208: The Weapons Officer did not authorize the 16"/50 caliber turret Division Officers to suspend the Weapons Department PQS program during the transition from 16"/50 caliber PQS book (NAVEDTRA 43415) to the revised edition (NAVEDTRA 43415A).

Comment: There was no suspension of the PQS program on USS IOWA at any time. Turret I was in the process of adapting to a revised PQS system and the paperwork entries were not being placed in the new records until the transition was completed.

FOF 210: PQS Boards in all three turret divisions were not updated weekly as required by NAVEDTRA 43100-1C and had not been since 1988.

Comment: There is no requirement for a "PQS BOARD."

FOF 212: (LTJG Hunt) the G-3 Division/Turret III Officer, without permission, suspended the PQS program in Turret III from November 1988 until 19 April 1989, while awaiting arrival of the new 16"/50 caliber PQS book. Specific examples of PQS accomplishments not forwarded include GMG3 Edge, GMG2 Barker, GMG3 Unger, GMG3 McDaries, and GMG3 Kilbury.

Comment: Turret III had stopped making entries because of the Division Officer's lack of confidence in some of the qualifying signatures in his division records. This was a conscious decision and the proper thing to do. At no time did the process of training or qualifying slow down in any turret. Personnel PQS accomplishment was recorded in a notebook maintained by LTJG Hunt.

FOF 227 c: Spark producing devices, including six lighters, were found on the remains of the deceased. A charred soda can containing a cigarette butt was found on the projectile deck in post incident clean up. No smoking apparatus (lighters, etc.) were found in the Center Gun room after the explosion.

Comment: Cigarette lighters were not permitted in the Turret. Their prohibition was stressed as a regular part of the safety training aboard IOWA. No step short of body searches, however, can guarantee that a sailor does not have a lighter in his pocket. The lighters had nothing whatever to do with the casualty.

Keys, knives and dog tags are not flame, heat or spark producing devices as that term is used in NAVSEA OP 4 (2-25).

FOF 227 d&e: The Turret Officer's Booth was regarded as outside the area of the magazine and pre-incident policy permitted smoking in the booth during those periods when gunnery evolutions were not ongoing. No personnel could be found who ever saw smoking in the magazine or inside the Turret (except in the Turret Booth).

Comment: Regulations in effect at the time of the explosion did not prohibit smoking in the booth except when gunnery evolutions were occurring. No one has alleged that there was smoking in the booth when gunnery evolutions were ongoing. Moreover, the FOF states that there were no known incidents of anyone smoking in the magazines or turrets. **Smoking had nothing whatever to do with the casualty**.

FOF 227 g: In the past, torn powder bags have been discovered during loading operations. Personal judgment controlled whether torn bags were loaded or placed in immersion tanks.

Comment: **Not one witness ever saw a torn bag in the gun rooms**. Regulations do not require immediate immersion of bags with minor tears. Even leaking bags can be used if "practicable" although none were used on IOWA.

Opinions

Opinion 13a: Proper attention was not given to preventing flame and spark producing items from being taken into the magazines.

Comment: **Ordnance instructions require no flame or spark producing devices be brought into Magazines. On 19 April the Turret was not considered a magazine by any ordnance publication or instruction. FOF 206 (e) stated that no personnel could be found who ever saw smoking in the magazines or inside the turret (excepting the Turret Booth - Not a magazine). Opinion 51 states that smoking was not allowed in the Turret during Gunnery Exercises.** At the time of the Turret II explosion there were no spark or flame producing devices found in any powder magazine. On 19 April the Turrets were not considered a magazine by any ordnance publication. As stated in FOF 206 (f) - No smoking apparatus (lighters, etc.) were found in the center gun after the explosion.

Opinion 13e. Standard Safety briefs were not given.

Comment: **Safety briefs were provided during a Pre-fire brief on April 18th and during on-station briefs on April 19th once stations were manned as required by Turret Pre-fire list. Turret I, II, and III Officers initialed on check sheets on 19 April that this had been accomplished**. These briefs were in accordance with instructions received at Refresher Training in GTMO during the fall of 1989. Briefs of the various spaces are conducted by Petty Officers' in Charge (POIC's). Although the content of a safety brief is not stated in any publication, IOWA conducts safety briefs before firings and holds safety brief lectures on station even when not firing but when stations are manned.

Opinion 15: IOWA utilized her Main Battery Guns to engage in unauthorized research and development.

Comment: This statement is incorrect. It is a false description of authorized gunnery improvement activities in process onboard IOWA. **All such activities with the exception of the use of incremental charge (5 bags) was sanctioned by higher authority. The use of a five bag charge was safe and met all criteria for use in a 16"/50 gun**. Moreover, IOWA personnel believed at the time that its use was also sanctioned as it had been shot 18 times in November 1987 with NAVSEA personnel embarked.

(a) **EX 146 ICM round was authorized by NAVSEASYSCOM.**

- RADM Meinig approved the testing.

- The test plan was provided by NAVSEASYSCOM.

- **NAVSEA/DAHLGREN personnel were** onboard **for test.**

(b) **The 2240 lb. projectile extended range projectile was approved as a test program by NAVSEASYSCOM**.

- CINCLANTFLT was kept fully assessed of the project.

- DAHLGREN personnel were onboard for the testing.

- NAVSEASYSCOM approved the configuration for at-sea testing without formal safety approval.

- NAVSEASYSCOM and COMNAVSURFLANT endorsed the use of an extra 50lb. "baglet" during the test and for fleet use afterwards as requested by CINCUSNAVEUR.

(c) **The 16" ASW round was an approved COMNAVSURFLANT project.**

- COMNAVSURFLANT 041446Z DEC 86 requested NAVSEA support for conduct of project and modification of MK-145 projectile.

- COMNAVSURFLANT provided the test plan.

(d) Incremental Charges were tested onboard IOWA prior to 19 April.

- **Due to previous firing by IOWA in November 1987, the availability of incremental charge range tables in World War II, numerous discussions with NAVSEASYSCOM on the advantages of incremental charges and planned NAVSEA incremental charge firings, IOWA Weapons personnel fully believed that the firings had been sanctioned by the appropriate naval authorities**.

- **Tests were** conducted **on 5 and 7 November 1987 using 5 bags per round of D846 and one HICAP projectile, D882.** A total of six rounds were fired. On 7 November 1987, firings were conducted using a 5-bag charge of D846 and one 2700 lb. BL&P projectile D881 per round. A total of 12 rounds were fired using this configuration. **NAVSEA representative Mr. Jerry Littel was onboard during the test**.

- Range tables for incremental charges were developed during World War II and were available.

- Incremental charge advantages were discussed at Battleship Improvement Conference with NAVSEASYSCOM and DAHLGREN personnel in March 1989.

- INCREMENTAL CHARGES WITH 2700 lb. projectiles provide a high degree of accuracy while maintaining gun bore pressure well below design limits.

- USS IOWA NAVGRAM 8034 Ser 007 14 March 89, discussed incremental charges and non-standard configurations including 50 lb. "baglets." COMNAVSURFLANT endorsed IOWA's recommendations on incremental charge usage.

- **A copy of a memorandum received by IOWA from NWS Dahlgren (Code G-12) in the fall of 1989 states that the findings of the NAVSEA Weapons System Explosive Safety Review Board in August 1989, cited that there was historical precedence for firing 16" projectiles with other than six bags. The board saw no problem with these ideas but decided that no additional firing be conducted without an approved program.**

- **5-bag incremental charges of D846 with 2700 lb. projectiles were test-fired by NWS Dahlgren during the summer 1989. The results showed gun bore pressures experienced were extremely close to those predicted by USS IOWA's Fire Control Gunner prior to the April 19th accident**. Pressures listed below are derived from NWS Dahlgren's published figures.

Service pressure of new 16"/ 50 gun 40,700 psi

Nominal proof pressure: 53,800 psi (IOWA's new gun proof pressure 55,930 psi)

6 bags of D846/2700 lb. proj: 53,100 psi 5 bags: 37,500 psi (pressure with copper crusher gauges, new guns)

6 bags of D846/2700 lb. proj: 40,400 psi 5 bags: 35,000 psi (pressure with pressure/time gauges, new guns)

6 bags of D846/2700 lb. proj: 49,199 psi **5 bags: 32,800 psi** (pressure with copper crusher gauges, IOWA's 20% wear guns)

6 bags of D846/2700 lb. proj: 45,825 psi 5 bags: 30.600 psi (pressure with pressure/time gauges, IOWA's 20% wear guns)

- **Based on the above information, the firing of incremental charges of D846 with 2,700 lb. projectiles is safe**.

- In the center gun of Turret II, the breech was never closed, and the firing voltage was never applied.

Opinion 26: IOWA's Turret Crews were not properly prepared for the Main Battery shoot on 19 April 1989.

Comment: This opinion is based on the unsubstantiated finding that the pre-fire briefing methods used prior to the 19 April gun shoot were inadequate. As discussed under the comments to FOFs 18-21, IOWA's turret crews were properly prepared for the Main Battery shoot on 19 April. **Critical billet personnel were briefed at the pre pre-fire brief on 18 April as to the type of exercise to be shot and at the Pre-fire brief as to the type of ammunition and safety procedures by Weapons Officer. Turret Crews in non-critical billets were briefed on station by the POIC's as to conduct of the exercise and safety procedures.** These briefs are and were part of the pre-fire check sheet for each turret.

Opinion 52: The investigation into and the analysis of all potential causes of the tragic explosion of Turret II have been complicated by the (a) **issues of improperly loaded munitions in the Center Gun (NALC D881 projectile with five full bags vice six)**, (b) **lack of effective, properly supervised assignment and qualification process** and (c) **poor adherence to explosive safety regulations and ordnance safety**. While those and other personnel error related issues were not the cause of the explosion and did not provide an ignition source, they cast the proper operation of gunnery system in USS IOWA (BB 61) in a poor light.

Comment: **Due to previous firings by IOWA in November 1987, the availability of incremental charge range tables in World War II, numerous discussions with NAVSEASYSCOM on the advantages of incremental charges and planned NAVSEA incremental charge firings, IOWA Weapons personnel fully believed that the firings of incremental charges had been sanctioned by the appropriate Naval authorities.** In the Center Gun of Turret II, the breech was never closed, and the firing voltage was never applied.

- **A copy of a memorandum received by IOWA from NWS Dahlgren (Code G-12) states that the findings of the NAVSEA Weapons System Explosive Safety Review Board in August 1989, cited that there was historical precedence for firing 16" projectiles with other than six bags. The board saw no problem with these ideas but decided that no additional firing be conducted without an approved program**.

- **IOWA's turret crews were well trained and fully capable of putting ordnance on target.** GMCS Ziegler was a totally competent and effective leader.

- The 16"/50 weapons system, is simple to learn and operate.

- 574 rounds were fired between August 1988 and 19 April 1989.

- **IOWA's demonstrated expertise in shooting and excellent material condition has been validated during numerous inspections**.

- Three PQS/Non-Nuclear Ordnance Reviews on 1 June/2 June and 18 September 1989 stated IOWA's programs were "**in full compliance with all PQS and Non Nuclear Ordnance Instructions** ... **properly installed, operating effectively and thoroughly documented**." These results were obtained with no further training conducted between April 19th and the inspection.

- **Deficiencies found in PQS documentation during the investigation were fully corrected in two working days, indicative of a PQS program that was established, dynamic and executed by a well-trained crew**.

- **IOWA meets and exceeds all explosive safety and ordnance safety regulations and certifications as validated by numerous inspections and assist visits**:

- Two highly experienced inspectors of the NAVSEA Explosive Safety Review Team attested to the high quality of training in all three turrets and particularly in Turret II.

- One of them, Mr. Robert Stilson, provided a sworn statement that during an ESR in September 1988, he found..."**The turret, projectile flats and powder magazines were in very good condition...The personnel were well versed in their professional certification for the 16" guns... and insofar as the training** records **for the turrets, they were**

all well documented and well maintained. I looked at 12 records, in depth for turret two, and found no deficiencies in their certification program for non nuclear ordnance. I made similar checks for the other turrets."

- **The Ordnance Handling Safety Assist Team (CINCLANTFLT ordnance handling experts), in December 1988, cited knowledge, procedures and accountability as EXCELLENT**.

- **To ensure that only the most reliable personnel are permitted to handle Non-Nuclear Ordnance, IOWA developed the Navy's first and only Non-Nuclear Ordnance Personnel Reliability Program (PRP). The program requires all potential ordnance handlers to be screened in a process similar to the Navy's Nuclear PRP program**.

- The Combat Systems Assessment ("CSA") Team (COMNAVSURFLANT CSMTT) in March of 1989 (one month prior to mishap) **cited overall combat systems assessment as SAT**.

- IOWA was cited by the CSA inspection team as being..."clean and professional, all areas inspected reflect good leadership/management and obvious pride of the crew in their equipment/system."

- **The CSA Team indicated that they reviewed all Weapons Department administration and PQS and found the entire department SAT for all weapons systems**.

- INSURV (LANTFLEET Board of Inspection and Survey) in March 89 (three weeks prior to mishap), stated that, "The ship's 16-inch turrets were found in satisfactory material condition."

- Following the inspection, COMNAVSURFLANT gave a special "well done" to IOWA's Weapons Department for its performance during INSURV.

- **IOWA sets, maintains and routinely validates its internal programs and detailed knowledge of requirements. IOWA has passed every test and inspection and has demonstrated unprecedented sustainability and high combat readiness at sea**.

Senator Cohen. That is all I have right now, Mr. Chairman.

Chairman Nunn. Thank you, Senator Cohen.

Let me get back to one point that we were talking about a few minutes ago, Captain, and then I want to ask you some of the detail differences between your views and the conclusions to which Senator Cohen was just alluding.

In your testimony you talked about the Navy's lack of a concept of operations or employment plan for the battleships. Does that mean that essentially you are saying that battleships are better than the Navy thinks they are and that they are not being used as they could be used? Is that what you are saying?

Captain Moosally. No. I am generally saying I think there are many in the Navy who think that the battleship is as good as I think it is. This is, again, on the east coast.

I think that the fact that the *Iowa* employment has done much to prove or analyze the real worth of the battleship.

When we went to the 6th Fleet and operated with the 6th Fleet, I think all those kinds of doubts went away. Without getting into classified matters, the battleship was really kind of the centerpiece over there for the contingency operations that took place in conjunction with the reaction to the murder of Colonel Higgins.

When you analyze this ship and you sit down and look at it, it is not just another cruiser or destroyer. This ship has got a place for 32 Tomahawk missiles, 16 Harpoon missiles, which is double the number on any other Navy ship. It has the 16-inch guns which are a tremendous capability. Eighty-five percent, I believe, of the world's population are in range of those guns. That means a lot of economic targets are in range of those guns. It is a lot of ordnance. It is, I think, over 832 rounds.

The big factor for me, when you have to get in close is the battleship is the most survivable ship, along with an aircraft carrier, ever built. A lucky Exocet missile hit or a lucky 130 millimeter shot from a battery ashore is not going to put that ship out of commission. That ship is highly survivable, highly sustainable. It can go fast. It can sustain itself.

For example, we refueled in Augusta Bay, Sicily on November 17. We arrived back in the States on December 7 without refueling with over a million gallons of fuel left. You can sail that ship forever and ever, but the key thing, once again, is this ship can deliver ordnance on target very accurately. It can survive a lucky hit; it can survive most Third World scenarios. To me, it is one of the greatest assets this country has in reaction to Third World crisis.

Chairman Nunn. How does the lack of appreciation of how that ship should be employed manifest itself on a day-by-day basis?

Captain Moosally. Well, let me say today I think there is a greater appreciation of the battleship. I think it was there before.

The problem was in the execution of the policy set by higher authority, and the manifestation, back when I came aboard the ship, as I saw it, was in the manning that we had and I think the actual employment of the ship. That is about it.

When I yelled to get things fixed, they were fixed. When I pointed out things that needed repair, such as the fluorescent lighting that we got down in the turrets now, when I spoke up and had a plan to fix things, we got the cooperation and they were fixed.

Chairman NUNN. Captain, getting back to what you consider the most important finding for a moment, you do agree with the finding of the investigation and Admiral Milligan's opinion that the explosion resulted from a wrongful intentional act, is that right?

Captain MOOSALLY. Yes, sir.

Chairman NUNN. Do you base that on having read the Admiral's conclusion?

Captain MOOSALLY. When I read the report and read the NIS investigation, that is the conclusion I come to.

Chairman NUNN. You think they are right in that?

Captain MOOSALLY. Yes, sir.

Chairman NUNN. Was that your intuition before this report was ever laid out?

Captain MOOSALLY. No, sir. I would never have thought of somebody doing a wrongful intentional act in these circumstances—not only taking their own life, but taking the life of 46 other people.

Chairman NUNN. Do you agree with the conclusion that GMG2 Clayton Hartwig most probably committed that act?

Captain MOOSALLY. Well, Mr. Chairman, I have not read, in detail, the lab reports, the forensic reports. As I said, I have been away for 6 months commanding a ship that was on a deployment.

I would not come out and say that. I would not make an unqualified statement that Petty Officer Hartwig is the guy who committed the wrongful act. I do not think I can do that.

Chairman NUNN. You, yourself, cannot do that?

Captain MOOSALLY. No, sir.

Chairman NUNN. Do you believe that Admiral Milligan, based on the investigation he conducted, is in a position to have made that conclusion?

Captain MOOSALLY. I cannot answer that question, Mr. Chairman.

Chairman NUNN. You are saying you, yourself, cannot judge that?

Captain MOOSALLY. I am saying myself, I cannot.

Chairman NUNN. Let me give you an opportunity to go on record as to your feelings of some of the findings that you say you disagree with.

One of the opinions, listed as number two on page 54 of this report says "*Iowa's* commanding officer did not (a) establish an effective PQS organization; (b) effectively use the PBFT to monitor the PQS programs; (c) maintain overall cognizance of the PQS program; (d) ensure that the PQS coordinator submitted monthly reports or conducted periodic inspections; and (e) adequately determine the extent and significance of the various PQS reviews conducted by the *Iowa* PQS coordinator in support of the standdown by the training command in support of TRE and by the CNSL's CSMTT during CSA."

I do not know what all those initials mean, but could you comment on that in general and tell us what, particularly, the key initials mean? PQS means personnel qualification?

Captain MOOSALLY. Yes, sir. As I said, PQS is a personnel qualification program. It in itself is not a training program, it is a list of minimum requirements and skills of any position on board ship.

When I came to *Iowa*, I found that the PQS program was not in the greatest of shape. I had a new instruction written. I conducted an internal PQS audit. I found at that time that we had some problems.

We then got into the preparation for Guantanamo Bay, going to Cuba. We had a TRE, which is a training readiness evaluation, done prior to going to Guantanamo Bay to see what your shortcomings are, so they can concentrate on those when you get there.

At that time, I was told that, I think—I forget the numbers, but like 75 percent of the spot checks they did on PQS, where they go down and actually go down and actually check their records, was satisfactory.

We did another PQS standdown in November, internal standdown on PQS, and found that we still had some problems. All the time this was going on, of course—and once again I am not trying to make excuses. From my statement, you can see the things we were doing. It was one inspection after another.

We did talk about—I do not attend the planning board for training, that is the executive officers' board, but we did emphasize PQS. When I went on my tours of the ship, I checked out PQS charts that were in things like the turrets and other spaces, and it appeared to me that we had a program which was training people.

Chairman Nunn. You disagree with this finding, then?

Captain Moosally. No, sir, I do not disagree with all those findings. I had a monthly report I was supposed to get. I did not get it. I made a determination that I would get oral briefings from the ops officer who was the PQS coordinator, so I did not take the monthly training reports.

In March, the Combat System Assessment Team, as I stated in my statement, came aboard and did an evaluation of PQS in the weapons department. At that time, the Chief Inspector told me that our PQS was satisfactory for the entire weapons department.

The criteria for a satisfactory mark was that you have a fully-implemented PQS program, so him having told me that—he said, your program is as good as any on the waterfront.

What they failed to do, they failed to properly check the 16-inch gunnery system, and if you read the testimony of the inspectors, one inspector thought the other inspector was going to do it, and in fact neither one of them checked 16-inch gunnery PQS, so they kind of gave a false impression as to the status of the PQS administration.

One of the assumptions here in the investigation is that a page four service record entry has to be made in order for somebody to be PQS-qualified, and in fact the PQS management manual specifically says that a PQS record entry does not have to be made until the individual leaves the ship, so in that regard some of the statistics with regard to PQS-qualified people to me is not valid.

Chairman Nunn. Let me ask one other question. On finding 13, it states here, "Ineffective enforcement of safety policy and procedures was the norm within turret II. Specifically: (a) proper attention was not given to setting and maintaining materiel Condition Zebra; (b) proper attention was not given to preventing flame- and spark-producing items from being taken into the magazine; (c) proper attention was not given to maintaining the integrity of the magazine sprinkler systems; (d) proper attention was not given to the wearing of battle dress; and (e) standard safety briefings were not given."

Would you like to comment on that finding?

Captain MOOSALLY. Yes I would. Yes, sir. I will take them one at a time. The setting of Condition Zebra. From what I have read in the report, that was based on a lieutenant on the investigating team who, two days after the explosion, went through the turret and decided that Zebra was not uniformly set. I do not know how you do that.

We have other investigators—Captain Miceli, who was before this committee here a few days ago, told us on his last visit to the ship that in fact Zebra was set.

Chairman NUNN. Tell us what you mean by "Zebra."

Captain MOOSALLY. Well, Zebra is a materiel condition. We have different hatches and doors on the ship, the lowest rating is X-ray, and those are things that are normally shut all the time. Those are things that are near watertight voids. X-ray fittings are closed.

The normal configuration for a ship is Materiel Condition Yoke. This means that all settings, X-ray and Yoke, are closed dogged down—what we call dogged down tight, and they provide watertight integrity. If you have a flood, and so forth, only one compartment gets flooded. You do not have what they call progressive flooding. It is also used to set up fire boundaries.

Generally, when you go to General Quarters you set Condition Zebra, and that means that that is the highest level of materiel condition of General Quarters. That compartmentalizes the ship more than any other setting.

During a gun shoot we are not at General Quarters, we are at what we call Condition 3 Steaming, which is a semi-watertight footing, but you do not have everybody at General Quarters.

When we go to gunnery stations, however, Zebra is set in the turrets, and so part of the check-off list for reporting "ready to fire" is that Condition Zebra is set in the turrets, that people are in battle dress.

So we did get the report that Condition Zebra was set in the turret, and the basis for the finding for the investigation team was that this lieutenant went through the turret 2 days after the explosion, after we had removed bodies and so forth, and had determined that Condition Zebra was not uniformly set. I contend that you cannot do that.

As far as flammable devices, yes, we were wrong there. I think six people were found with cigarette lighters on their person. None of them were in the magazines, as far as I know. Prior to the explosion the turret booth, which is the aft section of the upper part of the turret, was considered a smoking area because until you go to General Quarters or fire the guns there is no ammunition in the upper part of the turret.

The magazines are way below this area and it was generally considered okay to smoke there. We have since changed that policy, but that was the general policy on *Iowa* and I think the other battleships before the explosion so some of those devices may have been in that area.

So yes, there were six people in there that had cigarette lighters, and they should not have been there, and we emphasize that all the time, but to say that there were no safety briefs given to me does not hold up under the facts. At the pre-fire briefing that was given by our weapons officer, safety procedures were given, and when we go to General Quarters stations in the turrets a safety briefing is given by the turret officer and the petty officers in charge.

As a matter of fact, I have a signed pre-fire check-off list signed by Lieutenant Buck, the turret officer, which indicates that he in fact gave safety briefings to the people in the turret.

Chairman NUNN. So you disagree with that finding?

Captain MOOSALLY. Yes, sir, I do.

Chairman NUNN. Number (c), we did not get to, was the integrity of the magazine sprinkler system.

Captain MOOSALLY. Yes, sir. The one thing that they pointed out there—there are two things. One was the fact that the remote operator from turret I, after the explosion did not operate—the remote operator for initializing the sprinkler system from turret I for turret II.

The conclusion that it did not work came from a seaman who talked to another seaman. Every indication I have from the petty officers who were knowledgeable on this system indicated that the system in fact worked prior to the explosion.

The other discrepancy on the sprinkler system was the intraturret jumper hose which is hooked up on the powder flats for General Quarters. We did not energize that, although the check-off list says they energized it, because the hose becomes a trip hazard for people handling powders.

As a matter of fact, we have sent a message to Naval Sea Systems Command who agrees that it is a trip hazard, and it is going to be done away with. That is the reasoning why that piece of hose was not energized.

Chairman NUNN. How about, "Proper attention was not given to wearing of battle dress"?

Captain MOOSALLY. Well, I'm not sure where that comes from either, Mr. Chairman. There was a comment that the ship went to General Quarters and the people were not in battle dress. I can say that there was no time to get into battle dress.

I mean, when your house is on fire you do not stop and put on your best suit to get ready to go outside, and I think that we reacted in the best possible way. I would not expect people to be in battle dress who were not in the turrets at the time, because the rest of the ship was not at General Quarters.

Chairman NUNN. Thank you. Senator Warner.

Senator WARNER. Let me start with a preliminary question, and then I will refer to the findings momentarily. As a follow-on to those series of questions already asked—as I understand it, your personal opinion is that this tragedy was the direct result of a deliberate act?

Captain MOOSALLY. Yes, sir.

Senator WARNER. But that you disagree with the finding of the investigating officer which implicated a specific sailor, Hartwig?

Captain MOOSALLY. I do not disagree with that, Senator Warner. What I was saying is I cannot come to the conclusion myself.

Senator WARNER. Let me read it. It is opinion number 56—

> Based on this investigation report and after full review of all Naval Investigative Service reports to date, the wrongful intentional act that caused this incident was most probably committed by Clayton Hartwig.

Now, do you agree or disagree with that conclusion?

Captain MOOSALLY. I do not agree or disagree. What I am saying is I, as the commanding officer of *Iowa,* from what I have read, I cannot come to that same conclusion.

Chairman NUNN. You are saying, as I understand it, that you do not have the expertise, the knowledge, or the investigative knowledge to come to that conclusion?

Captain MOOSALLY. Yes, sir, that is correct.

Senator WARNER. Let me just follow up on it. Do you entertain or consider or have in mind any other plausible or reasonable explanation for what happened?

Captain MOOSALLY. No, sir, I do not.

Senator WARNER. Again, I am going to follow up on what the chairman just said. Once again, why is it that you cannot agree with that?

Captain MOOSALLY. I said I do not have the expertise or the knowledge to agree or disagree with it.

Senator WARNER. Well, now, you have had 23 years of naval service and have commanded other ships. How is it that you lack the expertise to either agree or disagree with that conclusion?

Captain MOOSALLY. Well, I have not had time, Senator Warner, to study all the laboratory results, forensic results, the various tests that were done with regard to this investigation.

Senator WARNER. Well, then, you have the expertise, presumably, as a professional naval officer——

Captain MOOSALLY. No, sir. I am not a munitions expert. I am not a munitions expert.

Senator WARNER. Well, is the admiral who prepared this report an expert?

Captain MOOSALLY. He is an expert certainly in some areas. He is not a munitions expert.

Senator WARNER. So, primarily, you have not had the time to go over the body of evidence?

Captain MOOSALLY. Yes, sir, I have not had the time.

Senator WARNER. And I am not in any way disputing that you had to press on with your duties for the ship's deployment. You have not had the opportunity to go back over the evidence. What I am trying to bring out is whether or not the reason that you do not agree with this is based on some other plausible explanation.

Captain MOOSALLY. No, it is not, no, sir.

Senator WARNER. So there is no mystery out here that we have not penetrated?

Captain MOOSALLY. No, sir. I have no revelations on any of this. If I did, believe me, I would have come forth a long time ago.

Senator WARNER. Thank you.

Senator COHEN. Would the Senator yield?

Senator WARNER. Yes.

Senator COHEN. I am still not clear in terms of the response because I think what the captain is saying is—let me pose it this way—assuming you had time to read all of the evidence, that you read the forensic material, that you looked at the pathology reports, I understand from your testimony you still would not have an opinion as to whether or not a particular individual committed the act or not?

Captain MOOSALLY. Yes, sir.

Senator COHEN. So, it is not a question of not having time. What you are saying is you do not have the expertise to reach a conclusion as to a specific individual?

Captain MOOSALLY. That is correct.

Senator COHEN. And given all the time—take the next 6 months off duty and review the evidence—you would not be in a position to affirm the results or the conclusions reached by the Navy?

Captain MOOSALLY. Yes, sir.

Senator COHEN. That is all I have, Mr. Chairman.

Chairman NUNN. I want to follow up on that. Do you believe Admiral Milligan had that expertise? Do you think he is qualified to make that judgment based on the report? You said he was not a munitions officer, either. What makes him better qualified than you?

Captain MOOSALLY. He has a team, and he has all the inputs.

Chairman NUNN. You are saying maybe his team had that capability?

Captain MOOSALLY. I think his team does, yes, sir.

Chairman NUNN. You think his team had the capability?

Captain MOOSALLY. Yes, sir.

Senator WARNER. Well, then, if I might resume on my time, you agree the team had the capability and they assembled the facts, then reached the conclusion, but you still do not agree with it? I mean, it almost infers that somehow the procedure of putting together these complex facts and drawing this conclusion is faulty.

Captain MOOSALLY. No, sir, I am not saying that it is. I cannot make those judgments. I mean, I just cannot make those judgments.

Senator WARNER. Suppose you were given the job of examining this accident, as was the Admiral. What would you have done differently or would you have done anything differently?

Captain MOOSALLY. I would have to look at what has been done and make that decision. I could not answer that.

From what I know right now at this time, what I would have done differently——

Senator WARNER. Well, do you have any recommendations as to how this committee might broaden or extend these hearings in an effort to try and make certain that nothing is left uncovered, to determine whether or not the Navy acted properly?

Captain MOOSALLY. No, sir. I think that you are doing everything from what I have seen, and in talking to the General Accounting Office personnel who visited the ship, I think that everything that can be done is being done.

Senator COHEN. Would the Senator yield further.

Senator WARNER. Yes.

Senator **Cohen**. One further point to try to clarify this. Captain, if you were not a captain but simply a juror, we have jurors who are empaneled every day who have no expertise, certainly, in forensic science or pathology or anything else, and they are called upon to make decisions, the prosecutor gets up, the plaintiff's attorney, whatever, makes a presentation of the evidence.

Under those circumstances if you were just a juror and the evidence presented to you, and you had an opportunity to review all of that evidence, are you saying that you would not be in a position to either come to a conclusion as to a specific individual without looking at your background and saying you are an ordinary layperson looking at the evidence the Navy has assembled and presented to you? Would you be in a position at that point to reach a decision as to whether the Navy points to a specific individual or not?

The question we have is are you afraid of a lawsuit or the Navy?

Captain **Moosally**. No.

Senator **Cohen**. So, you can answer the question, then?

Captain **Moosally**. Probably I could if I was a juror and all of the evidence was brought. Yes, I could make a decision.

Senator **Warner**. You would have the expertise to do it then?

Captain **Moosally**. I would have the decision-making expertise to make judgments.

Senator **Dixon**. What would your decision be then, if my colleagues would yield?

Captain **Moosally**. I do not know because I have not seen all the evidence.

Senator **Warner**. Well, Mr. Chairman, one of the reasons you have not seen it—we understand this—is you have been busy.

Captain **Moosally**. Yes, sir.

Senator **Warner**. But earlier you said you felt perhaps we ought to go back—not we, the Congress, but the Navy Department—and review the procedures for this type of investigation, which are time tested and time honored so as to allow the skipper of a ship to make comments on the findings of fact before the tribunal of the investigation draws its conclusions.

Captain **Moosally**. Well, I do not think, Senator, I said I wanted to change the procedures other than the fact that I would like to have had the opportunity to comment on the findings.

Senator **Warner**. I think that is one constructive observation.

Captain **Moosally**. Yes, sir.

Chairman **Nunn**. Senator Dixon.

Senator **Dixon**. Captain Moosally, if I could just go over a couple of things for clarification in the record. I am looking at page 22 of the inquiry in which you talked about the lack of a gunnery officer, and you indicated a number of different people had come aboard and one broke a collarbone and so forth, and then you say, and I quote you directly,

> So, I am down to the third team. I am looking for somebody to relieve him. So, I am there, what, 3 months basically without a weapons officer.

That is your testimony?

Captain **Moosally**. Yes, sir.

Senator **Dixon**. That is not a reflection on you. That is the situation you found and you were trying to work with it and improve it?

Captain MOOSALLY. Yes, sir.

Senator DIXON. Then you go on to talk about a fellow that you finally got. You did not pick him. That is who you got, and this is a fellow that troubled you about his mental state.

Captain MOOSALLY. After the explosion, yes, sir.

Senator DIXON. On page 23 or 24, of course.

Captain MOOSALLY. I do not think that is a damnation of the individual. I mean, a lot of people, including myself, underwent a lot of emotion that day and a lot of grief. People handle it differently.

Senator DIXON. No one would question that, my dear friend. I understand that perfectly. But, in reviewing the whole thing, the record, I think, is fairly clear that as the captain you were discharging your obligation as the commander to try to find the right man and at least at that point in time you had not personally been satisfied that you had that man.

Captain MOOSALLY. I do not know if I can say that.

Senator DIXON. You do not think that is a fair expression, though, Captain, in all fairness to you now of what you are saying on those pages?

Captain MOOSALLY. What I am saying on those pages is the individual that I got at the time of the explosion had difficulty coping with it. He became very emotional.

Senator DIXON. Now, I want to talk a little bit about——

Chairman NUNN. Senator Dixon, would you yield on that and make sure we are clear on this. Captain, are you saying that this officer did not have a problem before the explosion?

Captain MOOSALLY. No, sir, he had some problems. He had some problems, but not of this magnitude. I mean, he did not have any major emotional problems like he did after the explosion.

Chairman NUNN. You felt he was qualified before the explosion?

Captain MOOSALLY. Yes, sir.

Senator DIXON. Now in all fairness, Captain, I am returning to page 23. So all these things are coming together. You are talking about the fact that you are down to the third team still trying to find a guy. That is when the Admiral, who I am not going to name, "called me and said" X "really wants to get out of what he is doing. He is good at what he does. He is never going to be a superstar but he is good at being a gunnery officer", in your testimony, "so I accepted him. I got to tell you, looking back on it, I don't know what" X "has told you, but" X "is a basket case".

Captain MOOSALLY. Yes, sir. You are talking about the gunnery officer, who is not the weapons officer. You are talking about the number two guy in the department.

I was looking for a gunnery officer, and I had initially rejected this individual to come to the ship. This is when, in my testimony you bring out, I got the phone call saying that he would be a suitable guy.

Senator DIXON. You see, this is no reflection on you. I want to clarify that again if there is any question on that.

Captain MOOSALLY. I thought he was a suitable guy up until the explosion.

Senator DIXON. Now let me talk a little bit about this. Here, in all fairness to every one of us and certainly in all fairness to you, we are dealing with a highly complex tragedy. In truth, at least this Senator thinks that there is probably no explanation for it and that the truth will never be entirely known. I say that with no reflection on anybody.

Now I am looking at page 30, and I quote you. "Yes, sir. Well, my assumption is, from what I know, that the five bags were in the tray. They said my understanding from what people have told me is 'wait, we're not ready', and there was no indication of a problem. I thought that was maybe because we had a guy that, a little later, making sure he was all checked out on the rammer.

The only thing I can think of is that the black powder got loose there somewhere, there was some kind of ignition process where it went off due to friction or something else.

You know, somebody told me this thing about ember coming down the muzzle, and I have a hard time believing that, so I don't know what happened. I wish to hell we'd find out what happened up there. I'm offloading tomorrow, and" blah blah blah and so forth.

But the fact is, you were giving some thoughts about what you thought could have happened. It is your thinking at the time.

Now the fact is, there are other places in here which I am not going to bore you with reading, but there was a lot of discussion in here about smoking in there.

Captain MOOSALLY. No, I do not think there was any.

Senator DIXON. I mean the question of whether it could take place. I am not saying anyone did, but you were concerned about people smoking in there.

Captain MOOSALLY. We are always concerned about that.

Senator DIXON. Sure; and having cigarette lighters in there. In other words, this stuff is flammable.

Captain MOOSALLY. There was no evidence of anybody ever smoking in the turrets.

Senator DIXON. I did not say there was. I did not say there was.

Captain MOOSALLY. And there were no cigarette lighters in the powder magazines.

Senator DIXON. No. But the reason you keep all those things out is because it is flammable in there?

Captain MOOSALLY. Absolutely.

Senator DIXON. Sure.

Captain MOOSALLY. I think anybody who would bring a cigarette lighter or something like that in there would have to be scared out of his mind.

Senator DIXON. Yes, because it is dangerous.

Now I read from page 31. "Petty Officer Fisk was supposed to be the cradle operator, I believe, and Petty Officer Lawrence was supposed to be breaking in the first time ever as gun captain, and I'm just concerned that maybe Petty Officer Lawrence, since he's the one who did the prefire checks, signed them as a gun captain. He may have been the one at the prefire and possibly at the prefire brief." Then you go on.

In fact, at that time, people still thought Petty Officer Lawrence was in charge of that gun when you made this testimony on page 31 that day.

Captain MOOSALLY. Yes, sir. That is before the forensic evidence came in.

Senator DIXON. Yes.

Captain MOOSALLY. Petty Officer Lawrence did the prefire checks because that is part of the final qualification of being gun captain.

Senator DIXON. Sure.

Now I understand from all the testimony I have read here that the chief, whom I will not name, that was in charge of the guns, the so-called gun expert, had no formal training in gunnery or ballistics; is that true?

Captain MOOSALLY. I cannot believe that is true. No, I do not think that is true.

He is not in charge of the turret. You are talking about another fellow who was the fire control chief. He is not a gunnersmate. You are talking about the fire control chief.

Senator DIXON. The fellow that drove you nuts, I am talking about.

Captain MOOSALLY. Master chief fire controlman.

Senator DIXON. Well, according to his own testimony, in the Reserves for a living he sold pots and pans.

Captain MOOSALLY. All I know is Master Chief Skelly wrote the 16-inch gunnery handbook.

Senator DIXON. Yes. He is the fellow that——

Captain MOOSALLY. He is a very knowledgeable guy. He is a very knowledgeable guy in 16-inch gunnery. He is, as far as I am concerned, one of the best, probably the best fire controlman when it comes to 16-inch gunnery.

Senator DIXON. So that is our expert?

Captain MOOSALLY. I think he is pretty much an expert.

Senator DIXON. Was it brought to your attention, Captain, that certain members of your ship had indicated that there had been a rammer problem in turret II?

Captain MOOSALLY. No, I know of no rammer problem in turret II.

Senator DIXON. I want you to have an opportunity to correct the record if there is any question about it. Is it correct to say that prior to this occasion you were concerned about the overall quality of the wardroom as a whole and the replacement officers you were receiving?

Captain MOOSALLY. The placement officer is the individual I talk to to get—he is the one who handles my account, so to speak, when it comes to manning the wardroom with officers.

I had some concerns, yes, sir.

Senator DIXON. If your testimony still stands as it was given on the occasion when you talked to Admiral Milligan, you addressed those concerns with the Admiral?

Captain MOOSALLY. Yes, sir.

Senator DIXON. Now I do not wish to belabor a point to which nobody knows the answer, but is it not a fact that what you are saying here is you do not know? Is it not a fact that anything that is a conclusion drawn from all of this is highly speculative in character based upon the complexity of the situation and what had occurred there?

Captain MOOSALLY. I would not make that statement, no, sir.

Senator DIXON. You, yourself, would not draw a conclusion about what happened?

Captain MOOSALLY. No. I do not have all the facts.

Senator DIXON. You were the captain of the ship.

Captain MOOSALLY. Yes, sir, but that does not mean that—as I have said, I have been away. I left June 7. I deployed on June 7, and this investigation was still going on and did not finish up until after I was gone across the Atlantic.

Senator DIXON. Would you again tell us as you did once before. The NMP is the Navy Manning Plan.

Captain MOOSALLY. Yes, sir. The Navy Manning Plan is based on the total number of people in the Navy in a certain rating. NMP is your fair share, a ship's fair share of those people.

Senator DIXON. The NMP says there should be 130 gunnersmates?

Captain MOOSALLY. No, the SMD said there should be 130. The Ship's Manning Document.

Senator DIXON. The NMP says 118?

Captain MOOSALLY. 118, yes, sir.

Senator DIXON. You had 88?

Captain MOOSALLY. On that day, I had 85.

Senator DIXON. Excuse me. You had 85.

Captain MOOSALLY. The Navy Manning Plan changes depending on the number of gunnersmates in the Navy. So in April my Navy Manning Plan said I should have 100 gunnersmates. I had 85.

Senator DIXON. Now, it has been indicated to me, Mr. Chairman, that my time has expired. If I may ask one more question, Mr. Chairman.

You have indicated that, in fact, whatever training takes place in connection with manning these 16-inch guns takes place aboard the ship.

Captain MOOSALLY. Most of it.

Senator DIXON. Now I will ask you, was this the kind of training session that is the ordinary kind of session commensurate with training people for firing these guns?

Captain MOOSALLY. You are talking about the April 19 firing?

Senator DIXON. Yes.

Captain MOOSALLY. Well, every time we fire, of course, it is a training session.

Senator DIXON. For instance, for Lawrence that day, had he been the one there instead of Hartwig, that would have been his final time to qualify him so that whatever characteristics technically qualify him to be in that status would be met; is that right?

Captain MOOSALLY. That is correct.

Senator DIXON. So do I understand it to be the fact, then, that in this training what happens is that you do this normally in the same way it was done that day. You have this powder and these bags and so forth, and you go through the whole procedure?

Captain MOOSALLY. Yes, sir.

Senator DIXON. There is no school training of a type such as I have seen where you see these pilots training in these—what do they call those, Mr. Chairman?

Chairman NUNN. Simulators.

Senator DIXON. Simulators. All of us on the Armed Services Committees have seen these pilots training in simulators and things.

Captain MOOSALLY. No, sir. Once again, I would like to reiterate that the 16-inch gun system is a very simple system, and most of the jobs there, the tasks there, are mule hauling jobs, loading powders. The hoist consists of pushing three different buttons. If you can operate an elevator, you can operate the projectile hoist.

The skilled positions such as cradleman and rammerman are basically three-step operations. So they are not complicated.

Senator DIXON. But, in fact, you use these bags of powder?

Captain MOOSALLY. Certainly. They weigh 110 pounds for the full charge and 55 pounds—they are heavy bags.

Senator DIXON. They are explosive powders. They are flammable.

Captain MOOSALLY. Yes.

Senator DIXON. There is no simulated activity at some occasion prior to the——

Captain MOOSALLY. Oh, yes, sir, there is. We have dummy powder bags in the turrets, and we load those. In all the drills we have on the ship when we are not firing, we go to general quarters, and the turrets are manned. We do dummy powder loading drills constantly. That is what we did when the moratorium was on; when we could not shoot.

Senator DIXON. I see.

On this occasion and on other occasions as well, I take it, you use actual powder?

Captain MOOSALLY. For training, for loading drills, no, sir.

Senator DIXON. You did on this occasion.

Captain MOOSALLY. When we are firing, of course we use actual powder.

Senator DIXON. Now, just one last time for the record I will ask you, this testimony of yours that was given under oath, let me say in candor to you as an old trial lawyer and as a person who can appreciate the circumstances, I understand what you are saying when you are saying that you did not know this would go public. There are some things in this I am quite satisfied you would have tempered had you known it was going to see the light of day, and I would be the first to understand that.

Captain MOOSALLY. Yes, sir.

Senator DIXON. But I will ask you whether there is anything in this statement that you gave under oath that—let us put it this way, is everything you said in this statement under oath, on the occasion when you gave it, the truth, the whole truth, and nothing but the truth, as you see it now?

Captain MOOSALLY. I would say that it reflects my thinking at the time that I gave the testimony.

Senator DIXON. And you would stand by it?

Captain MOOSALLY. Yes.

Senator DIXON. I would ask, at the appropriate point, Mr. Chairman, if it has not already been done, that the full statement given by Captain Moosally at 13:22 hours on May 1, 1989, inquiring into the circumstances surrounding an explosion in turret II on board the U.S.S. *Iowa* on April 19, 1989 to the appropriate naval officers be reproduced in the record in full.

Chairman NUNN. Without objection.

[The information referred to follows:]

Interview of Captain Fred P. Moosally, U. S. Navy, conducted at 1322 hours, 1 May 1989, inquiring into the circumstances surrounding an explosion in Turret II on board USS IOWA on 19 April 1989.

Captain Fred P. Moosally, U. S. Navy, was called as a witness by the investigating officer, was sworn, and testified as follows:

Questions by CDR Swanson:

Q. For the record could you state your full name.
A. Fred P. Moosally.

Q. Captain, United States Navy?
A. Captain, United States Navy.

Q. Commanding Officer----
A. Commanding Officer, USS IOWA.

Q. Sir, at this time I would like to re-advise you of your rights under Article 31 of the Uniform Code of Military Justice.
A. Okay.

Q. You're advised that you're suspected of the offense of dereliction of duty as a violation of Uniform Code of Military Justice. You understand?
A. Yes, I do.

Q. You have the right to remain silent. Do you understand?
A. Yes.

Q. Any statements you do make could be used as evidence against you, either in a trial by court-martial or other disciplinary proceedings. Do you understand, sir?
A. Yes.

Q. You have the right to consult with lawyer/counsel prior to any questioning. This lawyer counsel may be a civilian lawyer retained by you at your own expense, a military lawyer appointed to act as counsel without cost to you, or both. Do you understand, sir?
A. Yes, I do.

Q. You have the right to have such retained civilian lawyer and/or appointed military lawyer present during this interview. Do you understand, sir?
A. Yes, I do.

Q. You have the right to terminate this interview at any time. Do you understand, sir?
A. Yes, I do.

Q. Okay. As I understand it, sir, you understand your rights, you expressly desire to waive your right to remain silent. Is that correct?
A. That's correct.

Q. You expressly desire to make a statement. Is that correct?
A. Yes, I do.

Q. As I understand it, you have two appointed military counsel that you consulted with and they are?
A. Commander Burnett and Lieutenant Hansen.

Q. And they're both with you here today?
A. They're here today, yes, they are.

Q. So you expressly do desire to have these lawyers with you present during this interview. Is that correct?
A. That's correct.

Q. Okay. This acknowledgement and waiver of your rights is made freely and voluntarily by you, without any promises or threats having been made to you, or pressure or coercion of any kind having been used against you. Is that correct?
A. That's correct.

RADM Milligan: Captain, I have your submitted statement. Do we need to get that for the record?

WITNESS: (Inaudible response.)

CDR Swanson: Okay. Let me lay a foundation for that.

Questions by CDR Swanson:

Q. Captain, as I understand it, you've submitted a written statement to the investigating officer earlier today or late yesterday afternoon. Is that correct?
A. Yesterday. I understand it was handed to you by Commander Burnett.

Q. Was it yesterday? Time's blurred.
A. Yes.

Q. As I understand, sir, you'd like that to become part of the record?
A. That's correct.

Q. And your written statement will complement and supplement your oral testimony here today. Is that correct?
A. That's correct. Yes.

CDR Burnett: Admiral, I was wondering if I could just interject a couple of comments?

RADM Milligan: Sure.

CDR Burnett: I handed you a copy of this document and I don't mean to have you read it or anything like that, but I thought I'd explain. I know that it's been a great concern to you to try to get on with this investigation as fast as possible and I have some extra copies for the other members. I don't think you really need to read it. I wanted to explain to you, though, that I've been the one responsible for the delay in Captain Moosally testifying, basically, because I've had to try and get up to speed on the general subject area here. I don't feel that I can even advise my counsel (sic) unless I have a basic feeling for, you know, what 16-inch guns do and so on, and that has taken awhile. So, I hope you understand that.

I did, quite frankly, through conversations with Commander Swanson, try and get more documentation and discovery. I knew, for example, you had about 600 exhibits, but I'm told that that's not really available. I understand that it's not available, although, I've tried to basically persuade Commander Swanson, you know, in terms of basic fairness, that it might be appropriate for the commanding officer. But my client wants to go ahead and testify, in any event, because he has nothing to hide and wants to try and clear the air on whatever it is that you desire.

I have to say that anytime someone--and I ask the question, "Well, what are the possible adverse consequences here?" And Commander Swanson very honestly and distinctly told me that Captain Moosally was at risk. Something like that, where there are 47 people dead, quite frankly, is a very scary word and it's very hard, quite frankly, not having had a lot of time to work on this case, to feel comfortable with that many deaths. But, nonetheless, I do not think and, I guess, I have to clarify that basically I've been the brakes on this whole system. I mean, I've been the one saying, "Whoa, whoa, whoa, I'm not sure, I'm not sure." It's not been the captain. I guess I wanted to just clarify that with you so that you understood who's accountable, if you like.

RADM Milligan: Okay. I understand your comments. Are we going to make this part of the record?

CDR Swanson: Yes, sir. I think we should attach this.

RADM Milligan: Okay. We'll make your written remarks part of the record so it becomes, officially, as such. I would only add to that, yes, we do want to get on with the investigation to find the ultimate cause for what happened down there and make those recommendations required to make sure this doesn't happen again on any other ship or IOWA. But, by no means, are we in a hurry to get on with this investigation in order to get it over with. We will take whatever time it takes to do this job thoroughly and as completely as we possibly can. Okay.

CDR Swanson: Do you want me to start, sir?

RADM Milligan: No, I'll start.

Questions by RADM Milligan:

Q. Captain Moosally, I've read over your statement. I haven't had the opportunity to go through all of the exhibits or enclosures, although, I've seen some of them prior to this. I do have some questions to ask at this point and certainly ask you to offer up whatever comments you have on any subject as we go along that might help us to----
A. Yes, sir. I would also like to make some, whatever, if it doesn't come out in the testimony, make some comments of my own at the end.

Q. We'll ask for that, for certain.
A. Okay.

Q. You're well aware, of course, that we've been looking into the training situation on the IOWA quite closely, mainly, qualifications of people on the duty stations in Turret II and other turrets, as a matter of fact, at the time of the accident.
A. Yes, sir.

Q. We've gotten into PQS quite deeply. One of the requirements in the PQS program is that the PQS coordinator for the ship submit to the commanding officer, on a monthly basis, a PQS summary to advise the commanding officer of how PQS is being managed and handled on the ship.
A. Yes, sir.

Q. Could you tell me the last time you've seen such a monthly summary?
A. Monthly summary?

Q. Yes. Monthly report, I guess.
A. I have not seen a monthly report.

Q. Okay. You understand that----
A. I have been briefed on monthly reports. I have seen what monthly reports look like, but I have not demanded that I get a monthly report.

Q. Okay. Do you think having had a monthly report--first of all, let me say we, at this point or at this juncture of the investigation, have reason to believe that a number of people were on watch stations in Turret II and the other turrets who were not qualified and certainly, formally, in the administrative process PQS-wise.
A. Well, I'd like to get into that, if I could.

Q. Okay. This is your time. Why don't you go ahead. Enlighten us.
A. Okay. Thank you. Okay, I will. One, when I came to IOWA I relieved, as in my statement, in May of '88. Through my policy statement, which you also have, and when I came on here, I emphasized PQS. I had emphasized PQS on my last command. I believe in PQS. I found that the PQS on IOWA was in pretty

poor shape. As a matter of fact, I had reason to believe that the ESWS Program was gun-decked prior to my arrival there. By that, I mean everybody had answers to the questions. It was kind of like, "We'll give you a bunch of lectures, give you a test everybody has the answers for, and then you're ESWS qualified." There was a number of people who used to come TAD there to get ESWS qualified, so I put a stop to that. After I got my feet on the ground in August of '88, I asked for an internal review. I ordered the XO to do an internal review of our PQS Program at that time, and I also made that part of the record, I believe, in my attachment, so I think I emphasized my concern about PQS.

I also made the statement in my battleship standards and every time I had a meeting with the XO, department heads wardroom and the chiefs, that my rule was that you couldn't stand a watch unless you were qualified to stand the watch. If you're under instruction, you had to be observed by a person who was qualified.

And, in time, as I said in my statement, I honed in right away during the relieving process, on our sound and security watch, fire parties, cold iron watch. At the time, we were going into dry dock, I wasn't overly concerned about the status of people standing watch in the turrets. I ended up firing the DCA due to the fact that I found out he was non-PQS. Watch standers, didn't know how to light off inductors, so on and so forth. I gave him until we got out of dry dock to do that, and when I checked the day we got out of dry dock, they weren't qualified. I went down and asked why he didn't do that and he said, "Well, we've never done that before on here" so he kind of ignored my order. At that time, I relieved the DCA.

I must also tell you, it's not in my statement, the engineering officer left shortly thereafter, turned in his papers, because he couldn't stand the pressure of what I was doing as far as raising the standards on IOWA, so he turned in a letter to me saying he could no longer take it. I used to have weekly visits by the Chaplain on his regard, saying he couldn't take any more. So he left shortly thereafter and Commander Kimberlane, my MPA, filled in as the engineer until I could get somebody new on board.

Anyway, getting back to August, I also--and I'll get into the weapons safety thing later, I know you're going to ask me about that, but as far as PQS goes, I think I've made it perfectly clear on the ship what my policy was. Now, how do you enforce that? Well, in August I did. Am I doing okay? In August, I did an internal survey which pointed out problems around the ship as far as PQS went. Those--that survey was given back to the department heads who were supposed to take it for corrective action.

Then we got into the TRE business, was getting ready for GTMO. The TRE came aboard and, at that time, they indicated to me that there was no negative comments on my PQS program. As I go around the ship, I check PQS charts to see if, in fact, guys were doing their PQS, that we had a viable program. We went down to GTMO and I know there was extensive training down in the turrets as far as weapons safety, handling of ammunition with the handling teams, I think, up to four times a week. We had a lot of GQ's down there. GTMO turned into, basically, an engineering ETT because of problems in engineering, a problem which was my major focus at the time.

I knew that during those GQ's the weapons guys were doing their training. I feel that the training was being done throughout this whole thing. I think that we, in fact, had people PQS qualified guys there. We had a PATLAT team visit during that period, also, to check our admin, and it was brought out that "Hey, yes, you've got--you haven't caught up with--the PQS hasn't caught up with the service record entries" so I emphasized that at that time. I think that was in the September time frame prior to going to GTMO. It may have been earlier, I can't say for sure.

I felt all the time that, hey, training is being done. Looking at the people I had in the weapons department, I can get into later, the fact that I ended up not having a weapons officer for a period of time, due to poor detailing by the Naval Military Personnel Command Center and then some accidents that happened to him--the guy that was incumbent. I'd like to get into the Weapons Department officer business a little bit later.

Then, of course, we came back, had NWAI right after GTMC which was one, only one, discrepancy. They checked all the surface records. I know it wasn't--they did check those people for training, it wasn't people in turrets. I had complete faith that the turret training was going on. I had what I thought was--Commander Kissinger, I think he was the number one commander over at SURFLANT, finally reported aboard. He had impressed me as being a pretty savvy guy. Admiral Glenn had called me and asked me to take Ken Costigan, when I wasn't going to take him because I knew he was passed over, and I was trying to upgrade the wardroom on there, and I refused to take him until Admiral Glenn asked me to take him. He said he's no--he's not going to be CO of a battleship, but he knows the weapons systems and he'll do you well as a gunnery officer, so I took him.

I felt that I had qualified people down there and I had a lot of faith in Senior Chief Ziegler who had, you know--I went down to Turret III when I came on there. I was ready to put Ziegler in charge of both Turrets II and III because Turret III was a mess. This is where I found the hatch that had been laying on the side for 2 years, hydraulic leaks all over the place, lighting that didn't work. They had 25-watt bulbs in because they were afraid they'd blow fuses at the 50-watt level, which those things are supposed to take, so I felt like I was taking action all the time to get those things corrected.

I was stuck with an SRA when I got there that really wasn't really well thought out, so I added a lot of extra things there to fix that. I fought NAVSEA to get the proper lighting done in those spaces. I think I did everything I could to upgrade the weapons safety in those spaces and the training. I demanded that they train...I found out that they weren't in the 5-inch gun area. Same thing. I found that--I called the master chief that they had sent off to teach school, 5-inch 38 School, back to the ship because I found that those guys weren't being supervised.

I mean, there were people that were left off--let to go somewhere else without supervision that I called back. There were officers who were let go without reliefs. Frankly, I'm kind of rambling here, I knew that the officer wardroom had been mismanaged on that ship for 2 years.

Questions by RADM Milligan:

Q. Well, let's get into the officer manpower thing a little bit later. Let's get----

A. Okay. Get back to training. PQS. Okay. Anyway, PQS, I thought that the PQS program, from what I had seen, we were on the right track. Now, in November, the type commander said that we had to do a PQS stand-down, and we did that. We have an instruction, we put out a 5050 notice, we assigned chiefs and officers to inspect the PQS in each area. We went through there and we found that PQS was improving. There was a big improvement from the last time.

And then the next thing was, you know, in March, the CSA guys came on board and they told me that PQS is "Sat." It's right in the message, PQS is "Sat," no negatives. So with all the things I had going on the ship, I had no indication from any outside inspectors, groups...that we were nothing, but just as good as anybody else and, if not, better. Those are the words that I heard from Commander Conley from the CSA team. Matter of fact, he said this as early as or late as a couple days ago. "You were as good or better than anybody on the waterfront when it came to PQS." So I had no reason to believe, as a CO, that PQS was a problem that I had on the ship

Q. Let me ask for a couple definitions of what you just said. I can go back into your battleship standards pamphlet here where it says "...no one will stand a watch unless he's qualified to stand that watch."
A. Yes, sir.

Q. What does "qualified" mean?
A. That means PQS qualified.

Q. How about "U/I." You use the term "under instruction."
A. Yes, sir.

Q. I understand what under instruction means, but how do you see under instruction----
A. I see "under instruction" as somebody that----

Q. ----in the gun room?
A. In the gun room. I see that as carrying out an evolution supervised by a PQS qualified petty officer, or officer or whatever. In other words, this individual has to be observed by a qualified--PQS qualified individual. I mean that's, you know...

Q. Well, the problem I'm having here, and I'll be right honest with you, you have people under instruction but you don't have qualified people who are solely there to man that watch and instruct that individual. You take the gun room of the 16-inch turret, you only have four people in the gun room itself?
A. Yes, sir.

Q. The gun captain, the cradle operator, the rammer, and the primer?
A. Yes, sir.

Q. So my example would be, if you were breaking in a new cradle operator, who would be his supervisor?
A. A qualified--a PQS qualified--I see, in other words, you're telling me it shouldn't be somebody that's doing the job. I say, you know, if the guy is there observing him, you know, this is a step function evolution. I mean 16-inch gunnery, loading gunnery, is not a very complicated thing. It's a very straight- forward thing and if a guy--being that it's a step function, I have no problem with a gun captain watching a rammerman. I mean, he's--that's kind of what he's doing. That's his job, you know, he's down there waving the powder on, so I don't have a problem with him doing that.

Q. So you're saying then that a watch stander under instruction can take the full--he can take that watch by himself and be supervised by someone who's standing another watch in the same gun room?
A. Yes, sir, but I don't look on it as a watch, Admiral. I think these are, like I said, it's a step series function where, in fact, I'm supervising a fellow who is ramming, as a gun captain, I'm overall in charge. I am qualified. If I'm a gun captain, I'm a qualified rammer and a cradleman so, therefore, I can supervise those people.

Q. How about----
A. And there's only so much room in those spaces. I mean, you can't get a bunch of people in there. I think that's one of the things in a 16-inch gun turret that I see. You have to have a guy that's in a one man--powder hoist operator for example. And you can't fit a lot of people in there to do the thing and also let him do it.

Q. I share your comments with regard to space and it sounds like safety is an issue.
A. No, sir.

Q. I'm not sure I share your comments with regard to the series of the operation because, when the three bags of powder roll out of the powder cart, three people are intimately involved in that evolution.
A. Yes, sir.

Q. Certainly not only one with two watching. It takes all three to make that happen safely, so----
A. Yes, sir.

Q. It might be difficult at that time to be supervising someone under instruction.
A. Also, I'd like to say that we have a chief in there who is watching evolutions and, if he's aware that somebody's under instruction, he certainly should be watching that. And also a turret captain, the first class that's in there, should be watching along with the turret officer. So there's plenty of people in that area to supervise.

Q. But they would normally be outside of the gun room looking in?
A. Absolutely, but they're available.

Q. You talked about your August PQS survey that you gathered all the data from and then turned around and sent it out to the department heads to make corrective action where required.
A. Yes, sir.

Q. Do you recall if the 16-inch turret PQS Program was of any significant notice at that time?
A. No, it was not.

Q. How about in the November stand-down?
A. No, sir. If it was, I would have taken action. I have no--nobody came up to me and said "Hey, the 16-inch 50 PQS is a problem," just the opposite, you know, that it's okay, and then I get a guy that comes aboard in March that tells me the same thing.

Q. Well, at the time of the CSA, was the comment that the 16-inch PQS Program is "Sat" and "Great," or was it just that "Our evaluation of PQS is Sat?"
A. Our evaluation of PQS is Sat.

Q. Because we're having a little trouble really determining exactly who looked at the turret PQS Program.
A. I hope they did look at it. I mean, that's part of their job.

Q. I understand, and we'll work on that issue.
A. Yes, sir.

RADM Milligan: Captain, do you have any comments on PQS? Any questions?

CAPT Messina: No, sir, I don't think so.

CDR Swanson: Were you going to move on from PQS, totally, sir?

RADM Milligan: We could come back at any time.

CDR Swanson: I think there are a couple questions I----

RADM Milligan: Okay.

Questions by CDR Swanson:

Q. Captain----
A. Uh huh.

Q. Subsequent to the 19th of April 1989, have you had an opportunity now to review the PQS qualifications status for Turrets I, II and III?
A. Yes, I have.

Q. And what have you found, sir?
A. Well I found, you know, you guys are--I think you guys are telling me I haven't got guys qualified. What I found was the paperwork was not up to speed with what the actual qualifications are. I think that we actually have qualified people in those turrets and it hasn't been properly documented. I think that, you know, here's what the weapons officer gives me today, which is completely different from what I saw. He's got Turret I--Christ, he's got all kinds of qualified people in there, according to this (holding up a report.)

Questions by RADM Milligan:

Q. Well, let's talk about center gun room of turret II on the 19th of April.
A. Okay, Turret II. There it is, right there.

Q. On the 19th of April.
A. Uh huh.

Q. The gun captain. Who do you say was the gun captain?
A. Hartwig.

Q. Qualified?
A. Qualified.

Q. The cradle operator?
A. Lawrence, qualified.

Q. Our information would support both those comments. Rammerman?
A. Backherms. Backherms, under instruction.

Q. Yes. Okay. Primerman?
A. I forget his name----

Q. Johnson.
A. Johnson, but he was qualified.

Q. How about the upper----
A. The powder car guy?

Q. Powder car operator?
A. I don't know who the hell that was.

CAPT Messina: Well, we're pretty sure it's Fisk.

Q. To the best of our ability, and we'll do some more testing with the forensic information when we get it all, but the best I can assume is that--determine at this point in time, is that it was Boatswain's Mate Second Class Fisk.
A. Yes.

Q. Who'd been aboard the ship for about, I believe, 2 or 3 weeks, and to be qualified to be the upper powder cart operator, you've already got--you've got a lot of PQS that has to be signed off before that...way far past whatever Petty Officer Fisk could ever have done.
A. True.

Q. As a matter of fact, it's our understanding that the day before or 2 days before the exercise, Petty Officer Fisk was taken from the deck force, from his deck work station, and taken up by Senior Chief Ziegler and Petty Officer Hanyecz and shown how to operate the upper powder cart station and returned to his work station afterwards, and that was the extent of his training up to that point in time.
A. I didn't know that.

Q. Now, the question of whether Petty Officer Fisk was actually the one in that station is still yet to be confirmed, but I think that's relevant. Seaman Johnson had been aboard the ship for a short period of time, 3 months, I believe. How long?

CAPT Messina: About 33 or 34 days.

Q. Petty Officer Backherms....

CAPT Messina: Backherms had been there about 90 days.

Q. About 90 days. So there is a lot of question about whether those people were...were qualified, and we're still running that to ground, but qualified, in my view, is not only had you done the PQS but it's been properly signed off and it's been properly administratively brought up to the service record and everything, until they can run a system that you can have any confidence in.
A. Right.

RADM Milligan: And, obviously, that was not always the case. We'll continue to pursue it to make our records of who was and who was not qualified as accurate as we possibly can.

Questions by CDR Swanson:

Q. Captain, again, you indicated that you have some more, some additional information. I would indicate that we've gone through the PQS qualifications for each of the turrets and our information discloses some large number of personnel in each of the turrets that were not PQS qualified for the stations that they were manning on the 19th of April 1989. So, if there's something you have that's more current that you think would be of benefit to us, we probably should look at that, but directing your attention to Turret III...
A. Uh huh.

Q. Our information is that there was no one in Turret III that was actively engaged in signing off PQS qualifications and that, in point of fact, the turret officer in his testimony, has indicated that his view was, at least his view as of 19 April 1989, that the PQS Program was in a state of suspension and had been in the state of suspension for a period of approximately 6 months or, possibly, even greater. Could you comment on that, sir?
A. I don't think that's the case. I think what happened there, what I understand happened, we had a--that's been my problem turret--had a Petty Officer Martinez, I think, that I threw out of there. My understanding is that the PQS had been done. Chief Miller, the new chief, wanted to validate the fact that it wasn't gun-decked, that they were waiting for the new books to come in, I think, which came in 2 or 3 weeks ago, which changed the PQS books, and that all these guys had been signed up through the book, but had not submitted to the weapons officer because they were waiting to get them all signed off at the same time.

Q. Who do you believe was signing off the PQS qualifications for Turret III?
A. I think Chief Miller was.

Q. Do you believe he's PQS qualified?
A. Do I believe Chief Miller's PQS qualified? Probably.

Q. Would you be surprised if I told you he was not?
A. No, I wouldn't.

Q. Would you be surprised to learn that he does not even have any scheduled PQS goals?
A. I would be surprised, yes.

Q. You would be, or would not?
A. I would be surprised, yes, because I think Chief Miller's a very knowledgeable guy. He's probably, now that Ziegler's gone, probably the most knowledgeable.

Questions by RADM Milligan:

Q. I don't believe Chief Miller came to this ship with previous 16-inch experience, did he?
A. No, sir.

Q. And I don't think--or, I do think, if you go into the record, you'll find that he has not had any PQS signed off, to this date, and had no goals for a time as to which he would achieve qualification as a turret captain which, obviously, would have to be his ultimate watch station there.
A. Right.

Q. Well, the questions, of course, on PQS, come from the ship's instruction with regard to the commanding officer's policy of PQS, and that's where we're coming from. The monthly report that we alluded to earlier, and we have copies somewhere here of the G-1, G-2--well, actually, it's all G-2 reports for about 6 months and, if I understand those reports correctly and if I'm wrong I'll certainly stand to be corrected, but it shows in that report in one column the number of people in G-2 assigned to specific watch stations, and the next column it shows the number of people who are PQS qualified for that watch station. That report, if I understand it, would highlight quite vividly, early on, that there's a lot of stations in the turret that are not PQS qualified.
A. Yes, sir. Like I said, I think a lot of that is that they are--there are PQS qualified and it's not--the paperwork hasn't been entered. You know, when I look at the proficiency of those crews, the other indicator I had on PQS was they kept getting better and better and we shot a lot of rounds, and I saw increased proficiency as we came out of the shipyard and continued shooting, that they were very good at what they did.

CDR Burnett: It might be useful to show them what the weapons officer gave you.

WITNESS: Well, this is what the weapons officer gives me. He's telling me that, "Hey, I got all these guys up there that are PQS qualified. I mean there's tons of them" and you're telling me something else?

Questions by CDR Swanson:

Q. Well, we're specifically looking at the stations those people were manning on the 19th.
A. Uh huh.

Q. Now, they might have PQS qualification for other than that position that they were standing, obviously. Captain, in terms of the PQS Program, the instruction, PQS instruction is one that you promulgated----
A. Right, in August.

Q. Since you----
A. In August, after what I found to be problems there, yes.

Questions by RADM Milligan:

Q. Okay. I want to shift over to another subject, at least for the time being, specifically, the exercise on the 19th of April.
A. Yes, sir.

Q. We have a lot of testimony on the details of the firing plan and everything, but my understanding is you were going to fire Turret I and then Turret II. They were both briefed as being in the exercise as part of the firing plan. Turret III probably would have fired had you had a successful day----
A. Not on my watch, it wouldn't have. It wasn't in the firing plan. I had no intentions of shooting Turret III.

Q. Well, a lot of people thought you did, so----
A. Well, they might have thought that, but it certainly wasn't briefed to me. It's not in the firing plan and what I was briefed is, we were going to shoot Turrets I and II. That's what I planned on shooting. I had no intention of shooting Turret III.

Q. How many rounds were you going to fire out of Turrets I and II?
A. I think there was a total of 22 rounds in the firing plan that we were going to shoot.

Q. Do you know how many of them were going to start?
A. No, sir.

Q. Well, explain to me or describe for me, the series of events from the commencing of the firing run for Turret I.
A. Okay. We were going to shoot--we shot--my understanding was we were going to go Turret I, left gun; Turret I, center gun; Turret I, right gun. Or, I don't know the exact thing, but we were going to shoot split salvo on Turrets I and II. We shot left and right gun, Turret I, and then we had a misfire on left gun, Turret I. Then I made the decision, let's fire, that's the end of that mission. While they're doing misfire procedures, let's go to Turret II and shoot a salvo out of Turret II, continue the exercise.

Q. Testimony here before would have had us to understand that the Turret I plan would have been, if I can find my proper notes here (perusing notes) "two, two, two" in Turret I, which I would assume would have been left/center/right, left/center/right.
A. Right.

Q. Here before, I've been under the understanding that the first gun to be fired would have been the left gun of Turret I and it misfired.
A. And it did misfire.

Q. It did misfire?
A. I don't--that's not vivid in my mind.

Q. Okay. Then you went--well, I need to get to a point here. Then you went to center and right, and then center and right for a total of four rounds out of Turret I. Your statement says two. I think, if you'll go back, you'll find it was four.
A. I don't remember.

Q. And then I believe you probably tried to clear the misfire out of Turret I.
A. I certainly did.

Q. Failing to do so, shifted to Turret II, which I certainly don't have any problems with, it's done all the time. What I really would like to try to get a better handle on is the time that you best recall, because the logs do not give us the information. We have the time that you commenced fire in Turret I, and we have the time of the explosion in Turret II. I can narrow that down to a number of minutes, but how long do you estimate it was between the last round fired out of Turret I and the explosion in Turret II?
A. I would say 10 or 15 minutes, something like that. It wasn't very long.

Questions by CAPT Messina:

Q. As long as 10 or 15 from the last round----
A. I think so, yes, because we had the marines up there and they were going through their spotting thing, they were going through their RT procedures for spotting. We were doing it by mission and the thing was, you know, end of mission Turret I, new mission for Turret II. I lost count, lost track of time, because I was talking to Admiral Johnson. I didn't rush anybody, it was--they were loading up Turret I and, in the meantime, I was over talking to Admiral Johnson ready to tell him "Hey, what a great--this is my best turret

and watch these guys shoot" and that's when the explosion happen. You know, I had given them permission to fire because they met all the parameters for range clear, and that's when they're allowed to load. As soon as I give permission to fire, they go down in the load position and start loading.

Questions by RADM Milligan:

Q. So you released the Turret II battery then?
A. Yes, sir.

Q. At which time the load order was given to load left/center/right?
A. That's correct.

Q. And what was your intention with regard to firing those three loaded guns?
A. Well, my intention was to do a split salvo. Now, I did mention to the weapons officer that at some time, if we could, I'd like to do an all three-gun salvo for Admiral Johnson. I didn't say I was going to do it then, I said I'd like to kind of...

Q. So your intent was, once all three guns were loaded, would be to fire the left gun spot----
A. Yes, sir, left gun spot.

Q. Center and right.
A. That's right.

Q. And you think it was about 10 to 15 minutes between----
A. I think so, Admiral. I can't, you know, it's a blur to me because I was not--as they were loading, I was talking to Admiral Johnson. You know, they were setting, plot was getting ready, and they had given them the mission and I was over there telling Admiral Johnson, explaining to him how the loading procedure went because I'd been up there myself and observed them loading the gun. As a matter of fact, I intended to do that with him later on, but that's kind of what I was doing, so I think at least 10 or 15 minutes went by.

Q. We're trying to rule out some of the potential causes for ignition in center gun, Turret II. About 10 minutes or a 15 minute interval there, it's important to me to try to narrow down to the most exact number I can get, with regard to the so- called burning or hot cinder philosophy, and that's why I mention that question. I cannot get it from the logs.
A. Yes, sir.

RADM Milligan: Do you have any questions on the issue of Turret I before I go on?

CAPT Messina: The XO covered pretty much the safety aspects. I don't think we----

CDR Swanson: Are you talking about the firing plan as it relates to Turrets I and II? Is that what----

Questions by RADM Milligan:

Q. Well, I understand what the captain's saying about the firing plan. It definitely does call for 22 rounds. My understanding that was six, ten, and six for the three turrets, with six for Turret III.
A. I'm not saying that the weapons officer or somebody else didn't think that. It was never in my mind. In my mind, we were only going to shoot two turrets. That's what I'd been briefed, that's what was in the firing plan.

Q. Well, the briefing was to shoot to port, as well. The original plan was to shoot to port----
A. Shoot to port.

Q. Turret III was out of the game.
A. As you know, plans change. You come up with an anchorage--or somebody and it changes. I had a problem with my--you know, we prefer to shoot that way because of, you know, what damage it's done and things to that nature.

CDR Swanson: Were you going to talk load configuration, sir?

RADM Milligan: Oh, yes. Okay.

Questions by RADM Milligan:

Q. The firing plan also calls for, along with 22 rounds, 44 cans of powder. Your statement addresses, to some degree, the firing with less than six bags of powder.
A. I say it there. I mean, it wasn't clear to me we were firing with less than six bags. I looked at that and saw "reduced charge" and, in my mind, it was six bags of reduced charge powder.

Q. Well, I guess I would ask you, and I think you just told me, what your definition or understanding of definition of reduced charge is. It's a NALC, it's six bags, probably 55 pound charge----
A. It was my understanding, you know, I had not in mind that we were going to shoot the five-bag reduced--their definition, my guys' definition of that...

Questions by CDR Swanson:

Q. Sir, you said you did, or did not...
A. Did not.

Questions by RADM Milligan:

Q. Was that briefed at the prefire briefing?
A. Well, I wasn't at the prefire briefing because I was on a conference--I was briefed separately. I was, you know, I read the thing, signed it, was briefed separately by the weapons officer. During the prefire brief in the wardroom, I was on a conference with--we were some kind of fighting the war up in STRIKE and I couldn't get out of there because we were on a conference call with Admiral Macke. He'd called all the CO's in there, some kind of "fighting the war" so, when the time came for that, I couldn't get down there.

Questions by CDR Swanson:

Q. To clarify, when you say "fighting the war," you're talking about the Fleet Exercise 389?
A. 389, yes.

CDR Burnett: I don't know. Something that hasn't been expressly mentioned, but the actual IOWA notice concerning the firing thing, only talks about Turrets I and II.

RADM Milligan: I understand----

WITNESS: He knows that, the Admiral----

Questions by RADM Milligan:

Q. It talks about Turrets I and II. I understand it talks about 22 round and 44 cans of powder, and I also have a lot of testimony that they intended and were going to shoot six rounds out of Turret I, ten rounds out of Turret II, and the six, I can only assume, would be for Turret III----
A. Yes, sir. I think, Admiral, I--having talked--I've got to be honest with you, I haven't even talked to--I think they may have intended that, but they never cleared it through me and I never approved it, and I wouldn't let it happen.

Q. Absolutely right. It's not over your signature because Turret III is not mentioned.
A. That's right. Yes, sir. So I never planned on shooting Turret III.

Q. But nor is the reduced charge, so to speak, of five bags of----
A. That's correct. I have never shot that on this ship before. I know it's been shot, I know you've had testimony that it's been shot. I don't see, personally see, a danger in doing that but I had not approved it, and when I saw reduced charge to the firing plan, to me, that meant six bags of reduced powder.

Q. So when you were briefed, verbally, at the time you saw the firing plan----
A. I was not briefed that it was going to be five bags reduced charge.

Q. Would it surprise you to learn that they intended to fire Turret III with four bags of powder?
A. Very surprising, very alarming.

Q. There's been more than one bit of testimony that would indicate that was the plan. Have you been made aware of that now?
A. Yes, sir.

CDR Burnett: You might want to mention what the weapons officer....

WITNESS: Well, he told me I never told you. He said I never told you about the five-bag, I never told you about the four-bag.

Q. Who, really, has got to give you the authority to shoot anything but the standard load out of the turret?
A. I would think that we would have to have authority from, you know, in this--I'll tell you, good question. You know, I've got--I think you saw my letter from George Minegan there about shooting that X-146 round. Everybody seemed to be aware of that to a point of offering up...CINCUSNAVEUR requested me to take up 30 rounds of it to Europe when I go there. The--I felt everybody had known about the DX-149 thing, that NAVSEA was aware of that and the long-shot, the super-charged bag, and I felt comfortable that higher authority was aware of what we were doing.

Q. Well, I think you did have authority to shoot the super-charge or the baglet.
A. Yes, sir, and I looked at the five-bag thing, then I saw the paper on that. It's like, you know, somebody gave a briefing but it was never finally approved. Up to this point, I have never shot a five-bag thing on here.

Q. And I can understand the pressure issue with regard to so many thousand pounds of pressure that would be built up in the breech with five vice six bags. My concern, in having some experience in the field, is that there are other things that happen in addition to pressure and, I don't know what they are. For instance, the subject of ringing has been brought to my attention with regard to pressure waves.
A. Yes, sir. My understanding is that's not a problem with the BL&P 2700 pound, BL&P, it could have been----

Q. Ringing effects, fuzing, so it makes common logical sense but, at the same time, how about a 2700 pound AP, would we do it with that?
A. No, sir.

Q. It's just a matter of USS IOWA is not a R&D platform, it's a fleet ship----
A. Right.

Q. A lot of these things that I'm hearing about, it seems to me they would rightfully belong somewhere other than at sea, at least, until they're approved through all the shore testing and directed to be conducted at sea.
A. Yes, sir.

RADM Milligan: That's where we're coming from on that issue. It's of some concern. Did you have anything else?

Questions by CAPT Messina:

Q. The other issue with that particular five-bag situation in Turret II is that those are 2700 pound projectiles----
A. Uh huh.

Q. ----were loaded into the thing and all the D-846 is clearly labeled and has a card in it and an envelope that says "Don't use this powder," and I think----
A. I understand that. I think that pertains to a six-bag load, I think that's why they went to five bags.

Q. If that was their motivation for going to five, is----
A. Exact--well, that's not the only motivation. The other motivation is for, you know, better accuracy on the gun.

Questions by RADM Milligan:

Q. They wanted to drop the IV?
A. Right.

Q. But they made the assumption that dropping from six to five bags and dropping the pressure was the only reason why that powder was prohibited with one heavier projectile. Now, I didn't write that prohibition, so I don't know what all the reasons are, but I do know that----
A. My understanding is it's because of the pressure that's built up with the six-bag charge and that five bags is not a problem.

Q. Let me go a little further, now, up until the time of the explosion, and I understand pretty clearly what took place on the bridge with regard to response. We've gotten into great detail talking to many, many of the people who responded so bravely on the deck and throughout the ship. Your statement refers to the first, and then secondary and, possibly, tertiary explosion.
A. Yes, sir.

Q. Can you give me any estimate of the times of those?
A. Well, I would say it was a matter of--the whole thing was a matter of 30 seconds. As I think I said in my statement, when the initial explosion went, I was on the starboard bridge wing with Admiral Johnson and I saw the terrible explosion, the smoke pouring out. I ran over and immediately ordered--sounding general quarters at that. As I was running over, I think, is when I heard a second explosion. When I walked--then I came around to the front of the bridge wing on the port side to the center polaris, I think I heard a third explosion at that time, so it was well within a minute or less.

Q. We have testimony from one of the earlier people to get into the turret, in fact, it was the first one in that, upon entering the turret, was thrown back up against the bulkhead, which could have been a----
A. Well, there was certainly a reflashes that went on within the hydraulic systems.

Q. Okay. Why don't we give you the opportunity, Captain, to go into the issue with regard to the officers, or manning.
A. Well, yes, sir. Number one, when I first came on here, you know, we had an NMP of 118 and I was 37 gunner's mates short at the time. I have messages where I sent messages out requesting...I also found out through the EPMAC and the BUPERS that the reason I wasn't getting any more gunner's mates is

because I was 37th on the priority list. The basic word I was getting was that, "Hey, you're not going to get anybody there, Captain, because you're so low on the priority list that you're never going to make it."

I think a lot of that was due to the fact that IOWA was not--well, let me go back. You know, since I went through the pipeline and got on my way to the ship, and since I got on the ship, I have felt like the battleship has been not--kind of out of it, no employment plan. The only employment I had on my schedule was this--of termination of August of this year, no concept of operations.

So I felt like we were kind of--if we would go away and hide somewhere, it would be fine with everybody, and I felt that to be 37th on the priority list for the biggest gun ship in the world was kind of credulous. I kept pounding away at that, that we needed to get people in there. As you know, not having the chiefs and the first classes and--that we were supposed to have, there's a deck plate leadership problem that becomes very difficult when you're talking about 16-inch gunnery.

I also had offered--I also found, of course, most of the training is on the job training that we have...had offered to be a school ship at one time, and nobody wanted to do that, we didn't have money to do that.

As far as the--when I first came to the ship, the weapons officer was being relieved concurrently with my relief, by a guy named Commander Honey. Commander Honey, as I went through the TOMAHAWK school, I heard from there that he was not a very good student, didn't think much of him. I checked into his record, found that he was not EOOW qualified, command qualified, and was obviously going to be a non-selectee for command and was going to be a "failed to select" commander here, shortly. This incumbent CO, Captain Sequist, agreed with me. Commander Honey was detached after about a week.

The next guy I had was the acting--the gunnery officer, as a matter of fact, Lieutenant Commander Lasowski. I have the sequence of dates here. Lieutenant Commander Lasowski--well, Commander Honey came on the 24th of May, I got there on the 16th, relieved on the 26th. Kosmich, who I tried to keep Kosmich aboard, he wanted to stay aboard but Admiral Butcher was deputy CINCLANTFLT, he wanted him over there for whatever he's doing. Lieutenant Commander Lasowski then became the weapons officer on the 30th of May, acting weapons officer. On the 5th of July, he broke his collarbone and he was not declared unfit to be the weapons officer because he couldn't get around the ship, and you got to get down in these spaces. I thought he was a pretty decent guy. So, on the 7th of July, he was relieved by Lieutenant Commander Ruthrick. So I'm on the third team, already.

And then I'm hurting for a gunnery officer, right? So they said they'd make Buch the gunnery officer. I don't--I think Morales was actually the guy that we put in there, who I had kicked out of "A" gang, by the way, because he screwed that up, so I'm down to the third team. I'm looking for somebody to relieve him.

They looked at a few people and they came up with Kissinger who arrived on the 24th of August. So I'm there, what, 3 months, basically, without a weapons officer.

Q. Off-loaded this entire time, right?
A. Yes, sir. Off-loaded. But a lot of critical work going on, a lot of things. I had spent a lot of time down in the weapons department during SRA to get things fixed. At the same time, I think you saw in my statement, to show my intensity of my rag on the Weapons Department, Master Chief Hickman and the guy I called back, Fulcher, who I beat up about the condition of the 5-inch mounts which really were in pretty bad shape, I yanked him back there, and they had both wanted to come up and see me and tell me "Why are you picking on us, the Weapons Department?"
I outlined why I was doing it, because of their PQS, their PMS, the

condition of their material, the condition of their mounts, and I said "Do you have any more questions?" and they put their tail between their legs and walked out of there, so much so, that Fulcher tried to get off the ship early because he couldn't take the heat. I found out about that and fixed him up, made him go down to GTMO with us, and wouldn't let him leave until the last day of the month.

So Kissinger comes aboard, very highly regarded. SURFLANT, I was told, he was number one out of 24 commanders over there. I guess had been your XO on the...HAYLER seemed like a very good guy to me. I mean, he--I still think Bob Kissinger's a well- meaning, intelligent guy. Then we searched for relief as the gunnery officer and that's when Costigan's name came up. Initially, as I told you, I rejected him because of the fact I didn't want a wardroom full of passed over guys who are not going to go anywhere.

As I told you, I had also relieved the DCA. The engineer had caved in on me and I must tell you that my focus for coming out of the shipyard was in engineering and the weapons area, engineering first, and damage control. At the same time this is going on, I made statement in there about having to go over myself and fighting fires over in the trainer there, because I had guys throwing down hoses and walking out of the place.

So all these things are coming together. That's when Admiral Glenn called me and said "Costigan really wants to get out of what he's doing, he's good at what he does, he's never going to be a superstar but he's good at being a gunnery officer" so, I accepted him. I got to tell you, looking back on it, I don't know what Ken Costigan has told you, but Ken Costigan is a basket case, right now. He completely collapsed on me during this whole thing. He had to see a psychiatrist. On the way back, he was totally useless.

I think, to this day, whatever the outcome of this thing, he'd have a hard time continuing on with his job. I don't have any confidence in him because of his mental state. I mean, if you asked Ken Costigan if he killed his mother right now, he'd say, "Yes, I did." So, he came on board. And I have addressed the wardroom issue to Admiral Borda in a letter, the whole wardroom issue.

In command screening, all three department heads failed the screen. Kissinger, they told me, because of his department head tour. I have my ops officer who ran a mine sweeper aground, back when he was lieutenant commander. Other than that, Bob Finney's another, I think a very good officer. Jan Coor is a guy that came to me, you know, I had a gap in relief as an engineer. If I had to rank those guys right now, before this accident, he would have been three of three. He's the only guy that has a chance for getting screened for a command.

So that's my wardroom, plus, I've got a lot of ex-amphibers, AE guys. I talked about the wardroom LORTARP. The placement officer told me he had not received the LORTARP from the IOWA in 2 years and I found it very difficult to find out who was doing what on there. When I came aboard, I ordered that that be corrected immediately, and the XO put out a LORTARP so we could start managing the wardroom which had not been done, in my book.

The SWO program was kind of screwed up and I think we got that on track. I've got four or five of those guys that just qualified. You had people who were running over the 2-year point that really had not--I think we got a handle on that now. But as far as the quality level in the wardroom, I'm not, you know, I've got an assistant ops officer who was ops on the FFG, and they told me he wasn't worth a damn on there and I've got him.

So, in summary, you know, the battleships, you know, where do they fit in as far as manning priorities? You've got a tremendous ship there, a big ship, a complicated ship and, in my view, the toughest ship in the Navy to run because of the age and the scope of the job, and I don't think it's properly supported as far as priority manning in the enlisted area or any officer area.

I get the impression that the Navy has one foot in the water and one out, not really sure how the hell long they're going to stick around. We don't want to make any commitments.

That's the--I have made initiatives, incentives for keeping people in the gunner's mate rate on there, keeping people, giving incentives to BT's and machinist's mates, double sea duty, more caps for the CO, because you got a lot of guys who are on there that are proud of being there, but I don't think you'd get many of them to come back, or BT's and gunner's mates, too damn hard. There's some real incentive problems there. There are manning problems there. I just don't feel that I've had the commitment of CNO on the priority list for manning those things.

Q. What is your opinion or position with regard to your G-1, G-2 and G-3 division officer and your turret officers, as opposed to----
A. Admiral, I think you know I'd certainly like to have more senior people in there if they were available. That's another thing that brings to mind things that happen. You get downgraded, billets get downgraded and you don't even get any input to it. This is an example, I think the turret officer thing--the Chaplain's got downgraded to lieutenant commanders, I didn't know that. The NMP changes without any inputs. As a matter of fact, the SMD study we just did said we should have 130 gunner's mates, not 118. Now, our NMP is 88. I don't know how in the hell--you know, there's no input from me on that.

I found out that the type commander is taking billets from me to man an MTT. Now, I didn't have any say in that. That's all being done sub rosa that I don't know about it. I was never asked my input on anything.

Q. Well, your NMP is not the function of...the SMD says you need----
A. It's a fair share. I don't see how my fair share can be 88 gunner's mates when I got--that's not--what I'm telling you is, I felt that I was short to begin with and it come from 118. They solved the problem. I'm now 88. That's how many I'm allowed now.

Questions by CAPT Messina:

Q. Your NMP would be your fair share of however many billets. Every time your billet gets cut, then you lose...
A. Right.

Questions by RADM Milligan:

Q. Well, that's true.
A. I think it would be good. I look upon--I don't think there's any qualification for turret officers as far as PQS qualification that I'm aware of. I must say another thing, you know, there's no school that I went to--I tried to dig books out of a PCO course up there on 16-inch guns. There isn't any. I didn't go to any school or anything that gave me an input on what 16-inch gunnery is all about. I got it from what I read from books. There's nothing that the XO went to, the weapons officer, or otherwise. There's no schooling for these chiefs. They throw them on there without the proper training. There's got to be some kind of en route training for these people.

Q. Were you aware that on the morning of the 19th, the turret officer, or--I shouldn't say "turret officer," but the only officer up in Turret I was Ensign Garrett who had been aboard ship for 16 days.
A. No, I was not aware of that. After the fact, I was aware of it but I wasn't aware at the time, that that was the plan to do that.

Q. Well, I don't know if it was the plan because, if you go to your firing plan, Mr. Meyer is the one who is listed as the Turret I officer.
A. That's who I would expect to be up there.

Q. He was on the bridge.
A. I didn't...

Q. How about Master Chief Hickman? You know, 27 years in the service, Master Chief Petty Officer, not that much training in 16-inch guns, but qualified as a turret captain on this ship, and yet he doesn't seem to have a big involvement right now in the turrets, or the training of the turret crews. He seems to be the admin----
A. He does a lot of admin things...he gets down--I make him go down in the turrets. He's been down in the turrets. I mean, I dragged him down there for material problems in the turrets.

Q. He hasn't been in a turret when they fired for a year, I don't believe.
A. I'm not aware of that. I don't believe that, Admiral, because he's taken guests down through the turrets when we were firing.

Q. Is that right?
A. Yes, sir.

Q. I thought it had been a long time. I may be wrong in saying a year.
A. I mean up--we had SECNAV. I know he took SECNAV down through the turrets while we were in the process of firing. He's the guy up to the phone talker on the bridge.

Q. Is he a competent master chief?
A. I think he's a very competent master chief. He knows the weapons area, he was stationed at Yorktown before here. He was called, I think, some of the best records ever seen by the CSA. I rate two master chiefs, I think I only got one.

Q. Well, that's another issue. I've been trying, since I arrived here, to get a handle on the number of powder bags that were taken from magazine A-515-M and passed on to the powder handling flats, and that's a very difficult thing to track down because he expended 18 cans in his ATR at the end of this whole evolution. I can only take what testimony I have as to how many unburned bags were thrown over the side.
A. Yes, sir.

Q. There were a number of them that were wet that were removed by EOD and your shipboard personnel, so it's a little bit difficult to figure what the exact number of bags were down in the magazine at the time of the accident.
A. Yes, sir.

Q. I don't know whether 18 cans is the right number or not.
A. I don't know.

Q. That's what was reported. How about Master Chief Skelly, is he competent?
A. I think he's competent. I think he could be a loose cannon. Master Chief Skelly, I think, had a special relationship with my predecessor on here--that I have kind of shunned him off. I'm sure, if you would have asked him before this explosion, he would probably say that I wasn't his favorite CO. I keep trying to put him where he belongs, you know, in his place there.

I think he's a very intelligent guy. I think he's an expert on 16-inch gunnery. I think he belongs in a laboratory somewhere. He keeps, you know, God bless him, he keeps trying to make the system better, you know, his heart's in the right place. He wants to make 16-inch gunnery better and better. I think Master Chief Skelly's a very competent, good guy, for the Navy. He has to be kept under control.

Q. So he was working directly with the weapons officer with regard to the number of powder bags that--his program----
A. Yes, sir. Yes, sir.

Questions by CAPT Messina:

Q. Did he ever specifically brief you on any of these calculations that he's making for----

A. No, Master Chief Skelly drives me nuts. I can only stand to spend about 5 minutes with him.

CAPT Messina: I understand that.

Questions by CDR Swanson:

Q. Have you ever reviewed his service record, sir?
A. No.

Q. Do you know how many years of active duty service he has?
A. Nine, I think. 7

Q. Do you know whether he's PQS qualified for any of the 16-inch gun positions?
A. No, I don't, no.

Questions by RADM Milligan:

Q. Do you have anymore on the manning issue?
A. No, sir.

Q. With regard to the data, when these ships were originally reactivated, the billets for the G-1, G-2, G-3, as best as I can recall, were lieutenant billets, certainly, second tour.
A. I think that's what happened. People have lost interest in these ships after they were initially manned and we're--I'm rather disgusted. I don't want to use some terms here but, as far as you know, it's from the type commander. My feeling during this whole time here is, if I could go away somewhere--and I've had people ripped off me to go on other ships, they think we've got too many people down there.

I have felt like somebody thinks they have people growing on trees down there. I've been told to keep my mouth shut as far as employment goes, when I pushed to get the ship on a deployment, because I saw that, if I didn't get one, that I would never be high on the manning priority list. As soon as we got a deployment, I started seeing people come in. Now, they're not trained people and we have to train them on there but, at least, I'm starting to get some chiefs, first class, and so forth.

Q. Well, how about damage control. Do you want to make any comments with regard to--I've read your statement and----
A. Yes, sir.

Q. I've certainly heard an awful lot from a lot of people with regard to how that was handled, and I look at it as a mass conflag, and it certainly seems to be the way it was handled.
A. That's the way I handled it.

Q. I don't know if that word was ever passed over the 1MC----
A. I didn't say "mass conflag"...had in my statement that I felt it was a mass conflag and that I had to take control. I've had guys telling me that they were scared out of their minds, and when I got on the 1MC, it calmed them down. I mean, they said, well, "Hey, the Captain's up there, he's in charge."

There was never any doubt in my mind of the picture that I had through the investigators. I felt comfortable with what was going on and I'm--I really never felt anything was out of control after the initial explosion, the flooding of the magazines and, once the investigators got on there, I felt like we had complete control of the situation.

I was concerned at times about the--when somebody told me that the bulkheads, like they were quavering there, I mean, they had progressive flooding, of course, we took action to shore those immediately. As it turned out, it really wasn't a problem.

After that, I felt, of course, the toughest part for me was the realization, as time went by, that there was 47 people dead down in that turret. That was the hardest thing to cope with.

Q. Are you aware that groups three and four flooding systems were energized before you made the announcement over the 1MC?
A. After the fact, yes.

Q. Does that disturb you, or do you think that was proper action?
A. That disturbs me, because I think that's a command prerogative. I think that, certainly, if these guys had seen things way out of control, then I would applaud it. Okay. "You took action." We teach people delegation of authority and when there is a real problem, yes, take action and take care of it.

That was never--as I still remember, Truitt, for example, coming up in an OBA briefing me on the flooding and where the water was, all that other kind of stuff, it was never mentioned to me that he had done anything or whatever to energize, before I gave the word to do it.

Q. Well, by the time he saw you, you probably already had passed the word.
A. I had--well, I think it was like 7 minutes after the explosion when I passed the word.

Q. It was probably not more than 3 minutes before that----
A. Yes, sir.

Q. ----that he went up to DC central to do that. Any more comments on damage control?
A. No, sir. My only comment is that the training that we accomplished on there in the past, and me being a stickler on damage control, firing the old DCA, I did all the right things. I thought that--I thank God that I put that much effort into it.

Q. Any lessons learned?
A. Lessons learned is, those proximity suits they had were, you know, we just got those a couple weeks before, and guys that had the training, my God, it really paid off, big time. We're going to put together a "lessons learned" message. I don't have anything, off the top of my head.

Q. Familiarization of the lay-out of turrets for damage control type personnel, that would be a lesson learned.
A. That would be helpful. That's one of the miracles of this whole thing, in my book, is the fact that nobody was injured, seriously injured, in the fire fighting.

Q. It's pretty incredible.
A. Yes, sir.

Q. There is a lot of testimony you will obviously see, in time, that infers that some of these guys were in the turret for the first time in their lives.
A. Yes, sir.

RADM Milligan: In less than optimum conditions.

Questions by CAPT Messina:

Q. Just one quicky. With respect to your experience at Guantanamo Bay in damage control, did you feel like you got sufficient preparation----
A. Absolutely.

Q. ----at damage control? There is some discussion over--on the staff on what's an adequate period of time for a battleship at Guantanamo Bay, and I recall there is a number of 57 days----

A. Well, I can tell you it's not adequate if you got to do all the things. In my view, battleships should go to Guantanamo Bay for DC and engineering, period. You can do some of the other stuff on the side, like navigation, do that just coming in and out of port. I think battleships shouldn't have the LTT approach, myself.

Q. Plus LTT for the other selective areas.
A. Right.

CAPT Messina: I don't know if we have LTT's that can support you. That's, I guess, the question.

Questions by RADM Milligan:

Q. We mentioned flooding the magazines. What is your assessment of what your understanding was, with regard to the condition of your sprinkler system, prior to the incident?
A. My understanding was the sprinkler system was in great shape. I had no indication--there was nothing. I review my 8 o'clock reports, I had no CASREPs. I told everybody that I don't want any surprises. I know that Chief Ziegler--that we had a magazine sprinkler check not too long before this thing happened, and I understand that Chief Ziegler told Master Chief Hickman that everything had checked out okay, so my understanding was it was in good shape.

Q. Are you familiar with the jumper hose required for the inner turret system?
A. Yes, sir.

Q. Do you have any comments as to whether or not your crew has taken and hooked up that hose and pressurized that hose?
A. I would think they do. I can't personally judge that. We've had trouble with the 5-inch magazine sprinkler system which, you know, the valves didn't operate properly and which I highlighted to the system. And, as a matter of fact, the WISCONSIN, they found out had the same problem, that you couldn't turn the remote valves in the 5-inch sprinkler. I took action to get that fixed.

Q. How about taking a few minutes, now, to give me what you think is your assessment of what took place in the center gun of Turret II. Make the assumption that the whole incident started right there.
A. Yes, sir. Well, my assumption is, from what I know, that the five bags were in the tray. They said--my understanding, from what people have told me is, "Wait, we're were not ready" and there was no indication of a problem. I thought that was maybe because we had a guy that--Backherms was up there--a little later, making sure he was all checked out on the rammer.

The only thing I can think of is that the black powder got loose there, somewhere, there was some kind of ignition process where it went off due to friction or something else. You know, somebody told me this thing about an ember coming down the muzzle and I have a hard time believing that, so I don't know what happened. I wish to hell we'd find out what happened up there. I'm off-loading tomorrow and, you know, I looked at the Yorktown message on the powder. I mean, I don't have a lot of faith after reading the OP that that powder is very good.

Q. We're having some special tests made on it. You're probably well aware of that, and a few others?
A. Yes, sir, I saw your message. You know, I don't know what happened, Admiral. I--that the breech was opened and they put the powder in, couldn't get it to close in time. God, I don't know.

Q. Well, we don't really know who all showed up at some of the pre-prefire and prefire briefs. You know, there was a fellow by the name of Williams, Seaman Williams, who was supposed to be in the upper powder car station who

didn't sail with the ship.
A. Yes, sir.

Q. His absence was recognized, I assumed, at least 2 days before the exercise, because that's when Petty Officer Fisk, apparently, was trained, rether rapidly, to man that station. Petty Officer Fisk was supposed to be the cradle operator, I believe, and Petty Officer Lawrence was supposed to be breaking in, the first time ever, as gun captain. And I'm just concerned that maybe Petty Officer Lawrence, since he's the one who did the prefire checks, signed them as a gun captain. He may have been the one at the pre-prefire and, possibly, at the prefire brief.

So then I can build the scenario where, all of a sudden, Petty Officer Hartwig was brought in there and Lawrence put him in as cradle operator, which he's qualified for, so he could move Fisk over to the carriage operator. And Hartwig takes over as gun captain and, up comes the powder, and out comes the two and the three bags to add to five. You know, initially, if he hadn't been briefed on that, then he's got a question and I don't think he's going to ram it home. He probably never fired five bags in his life. So that's----
A. We've fired that. I'm sure he was aboard that configuration before.

Q. I'm not sure he was the one that fired or he's even aware of it.
A. He may not have been, yes, sir.

CDR Swanson: You mean, in November of '87, sir?

WITNESS: Yes.

Admiral: He'd been aboard a long time as long-time qualified gun captain.

CAPT Messina: I believe he was aboard sometime in '86.

WITNESS: He was getting ready to detach in August, I think----

CAPT Messina: He was getting ready to leave.

Questions by the Admiral:

Q. So I don't know if that's the problem we have or not. And then, finally, we resolved the fact that we're going to do it with five. There's no correspondence, there's no communication over any net on that, so that kind of rules it out. You would think you would hear something over the circuit.
A. Exactly. "Hey, why do I only have five here?"

Q. You don't see that at all. You know, what we have the is problem and I don't--you're on the bridge there, were you getting to the point of being somewhat concerned to see the center gun, there was 26 seconds and behind the right gun?
A. I was at that--about ready to leave Admiral Johnson and come over and ask him, you know, "What's wrong here?" when the thing happened.

Q. So, we have a problem, a little bit out of the ordinary, and the next thing you knew, the massive explosion, or something. It's going to be tough for us to continue to pursue the solutions that were causing this to happen.
A. Yes, sir.

Q. Okay. Any other comments?
A. No, sir.

Questions by CAPT Messina:

Q. Ziegler. How well did you know Senior Chief Ziegler?
A. Very well. I tried to get him to stay in the Navy. He--I don't know if he is German or not, but he approached me. He impressed me as being very precise, attention to detail. He had the best turret when I walked around the turrets there. When I first came aboard, Turret III was in the worst shape,

and Turret I and Turret II were in very good shape, and I attributed that to his leadership. And he knew, he was very concerned--he was concerned that when we ran down the ammunition and we didn't--"Captain, we need to get more ammo on here." He was a stickler on PMS safety. He was just a no-nonsense guy.

As I said, recognize--we did the ranking. We're required to do chiefs ranking this year for the first time. He was ranked one of all the senior chiefs, and that was based on inputs from all department heads and his peers. I had complete faith in the man. I think, as I said to Admiral Johnson, it's my best turret, and I felt that he was the biggest part of that. He didn't mess around. I mean, he was a kind of guy of a--he was a moody guy. The fact that, if you did something that out of the--that wasn't by the book, he'd get pissed and he would say something to you about it.

He--I had him convinced. He had put in his papers to retire and I talked to him about it, "Hey, why don't you stay, you know, you ought to really--you ought to stay." His wife was an invalid in a wheelchair, and I think that's the primary reason that he was getting out, that she has MS. She's a wonderful woman. I met her at the memorial service. And he was a geographic bachelor, as she lives up in New York. And I said, he--you know--he was just dedicated to what he did. He was the best at everything he did. He was the best watch bill coordinator. He'd jumped on guys for safety things. He was a tough, good guy, but I think the troops liked him down there.

He then--he took his--he withdrew his retirement and, thinking about it, and took them out again. He didn't want to come up and tell me that, he just did it. He was the kind of guy, if he didn't want to offend you or didn't want to--he wanted to please, I think, if he saw you coming down the passageway, he would go to another passageway. He couldn't face me with the fact that he, once again, put in his retirement papers. That's the kind of guy he was.

Q. Well, with respect to his supervision in qualified people then, you would expect--
A. I would expect the best. I expect the best.

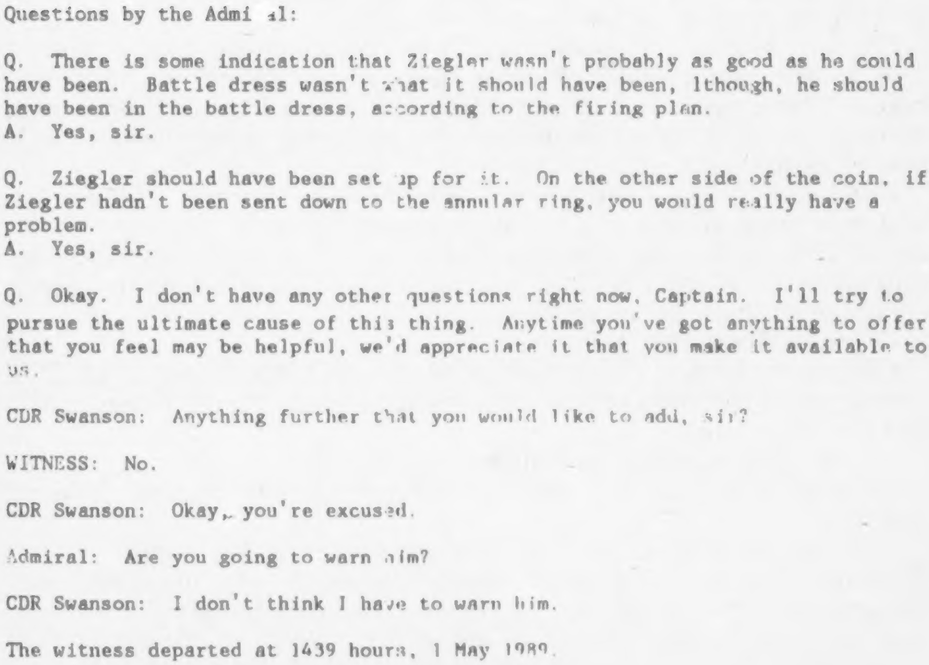
Q. You've fired nearly 400 rounds in the last few months. Anybody ever report broken bags?
A. No, never.

Q. The only other issue is a smoking issue. We're trying, I guess, we've pretty much covered it....
A. You mean smoking in the turrets?

Q. Smoking in the turret booths.
A, You know, the rules are pretty plain. I'm--you know, we thought--I haven't had anybody to mast for smoking in a turret. I've had but one guy to mast for awhile back, for gun-decking the magazine temperature. They've brought him to mast and I've busted him. I made it perfectly clear to everybody that stood the watch, and I'd catch a guy sleeping on the watch, and I'd have an after-steering once in awhile or down in the cold-iron watch, I took them to mast. I didn't make any bones about it. To me, that was the most important thing in the world, and I would suspect that you can never be anywhere all the time, but I would suspect that Ziegler would be the kind of guy that would not put up with safety violations.

Q. Well, I'm not so sure that they did put up with safety violations. I think what they've done is they've sort of established this policy that, when there was no ammo there, you can smoke in the back of the turret booth, way back from the beginning, as the way I understand it, now.
A. Yes. I wasn't aware of that.

Q. But noone--there was never any discussion on it, of this being the problem, I guess, is that----
A. That's right.



Questions by the Admiral:

Q. There is some indication that Ziegler wasn't probably as good as he could have been. Battle dress wasn't what it should have been, although, he should have been in the battle dress, according to the firing plan.
A. Yes, sir.

Q. Ziegler should have been set up for it. On the other side of the coin, if Ziegler hadn't been sent down to the annular ring, you would really have a problem.
A. Yes, sir.

Q. Okay. I don't have any other questions right now, Captain. I'll try to pursue the ultimate cause of this thing. Anytime you've got anything to offer that you feel may be helpful, we'd appreciate it that you make it available to us.

CDR Swanson: Anything further that you would like to add, sir?

WITNESS: No.

CDR Swanson: Okay, you're excused.

Admiral: Are you going to warn him?

CDR Swanson: I don't think I have to warn him.

The witness departed at 1439 hours, 1 May 1989.

Senator DIXON. I thank the chairman.

Chairman NUNN. Let me just ask you a few more questions, Captain, along the line I was asking a few minutes ago, relating to these findings.

On page 56 of this report, finding number 15 says, "As a result of the efforts of Skelly, working informally with employees of NAV SWC Dahlgren, *Iowa* utilized her main gun battery to engage in unauthorized research and development."

What do you say to that finding?

Captain MOOSALLY. Well, I do not agree with that. There was a number of projectile powder combinations that we shot. And every one of them were authorized in writing by a proper authority, Naval Sea Systems Command or whatever.

We shot what they call the EX-146 round, which is a sub-munition round; we shot the ASW round before I got there; we shot the 24-mile shot down at Vieques with the 2,240 pound round. Those were all fully sanctioned and authorized. The only real issue is the five-bag incremental charge. I have stated in my statement, that was not formally authorized. It was, however, fired on *Iowa* in November 1987, 18 rounds of it were fired. It was discussed at the battleship conference in March 1989 as a good thing to do, to improve the accuracy of the guns.

And I believe that there was implicit, if not formally-written authority, there was implicit authority that that was okay to do that. But there was not formal authority.

And as I said, the five-bag incremental shot should not have been planned to be fired that day. It did not have my approval. I was not properly briefed. And it did not have formal approval of higher authority. But I do not agree that we were an unauthorized research and development laboratory.

Chairman NUNN. You are saying that one incident, you believe, was an aberration, rather than a pattern?

Captain MOOSALLY. Absolutely. It never happened before when I was in command—since I have been in command. It happened before I took command in November 1987. And I think there was a feeling on the ship by people in the weapons department that it was okay to do it.

Chairman NUNN. Let me ask you now on finding number 23, which is page 57, quoting from the report, "*Iowa's* commanding officer did not effectively oversee the planning in preparation for the gun shoot on April 19, 1989. Specifically . . ." I will ask you about each one of them as we go.

Captain MOOSALLY. Yes, sir.

Chairman NUNN. "Specifically, A, he did not know that ENS Garrett was the only officer scheduled to be in turret I during the gunnery exercise."

Captain MOOSALLY. Can I answer that?

Chairman NUNN. Yes, we will take them one on one. You go ahead.

Captain MOOSALLY. Yes, sir. Ensign Meyer is the turret officer; Ensign Garrett is his relief. Ensign Garrett was up there, but Ensign Garrett was not the turret officer. Petty Officer Mortenson, who is probably the—as a matter of fact, wrote a lot of the PQS manual for the Navy for 16-inch gunnery, was the acting turret officer. GMG2 Krell was the turret captain.

So, although Ensign Garrett was in there, he was there to observe and to learn, he was not the turret officer. GMG1 Mortenson was the turret officer. So I do not see a real problem for him being up there.

Should they have informed me that he was going to be up there? I am not so sure that was necessary.

Chairman NUNN. All right. "B, he was not informed of the unauthorized load configuration used in turret II, which had been coordinated by FCCM(SW) Skelly, and approved by the gunnery officer and the weapons officer."

Captain MOOSALLY. That is correct. And I made that point myself.

Chairman NUNN. That is what you said in your statement?

Captain MOOSALLY. Yes, sir.

Chairman NUNN. "C, he was not informed of the following with respect to turret III. Number one, that turret III personnel had been briefed that they would shoot if time permitted during the gunnery exercises."

Captain MOOSALLY. Yes, sir. That C–1, 2, and 3, I could address that by saying, no, I was not properly briefed, and neither was the weapons officer. And that was a fantasy of some people who thought they could shoot that day.

Turret III was not in the firing plan that I signed and approved. And it was never going to be shot.

This is a case of some over-ambitious people who wanted to get some shooting in that day, but, in fact, were not going to shoot. It was never approved; turret III was not going to fire.

Chairman NUNN. All right.

Number C-2, "The turret III personnel were moving powder and projectiles in preparation for the gunnery shoot."

Captain MOOSALLY. That is correct, yes, sir. They did that. And these are the things that, once again, my subordinates were taken to mast for and punished. That is correct. They are not allowed to move projectiles or munitions of any kind without my permission.

Chairman NUNN. Number C-3, "An unauthorized load configuration was to be employed by turret III, which had been coordinated by Skelly and approved by the gunnery officer and the weapons officer."

Captain MOOSALLY. I do not agree that it was approved by the weapons officer. The weapons officer had no knowledge of this. And if he had, he would have told me. My weapons officer is a very truthful naval officer who has a lot of integrity. And if he had known about it, he would have told me.

Chairman NUNN. And then number 24, "On April 19, 1989, lax command oversight and ill-defined main gun battery ordnance handling procedures resulted in the unauthorized movement of powder and projectiles in turret III."

Captain MOOSALLY. Well, that is a repeat of finding of fact 23, so I do not know why they had to have a fact 24.

Chairman NUNN. The same answer to that?

Captain MOOSALLY. Yes, sir.

Chairman NUNN. You agree that it happened, but I guess you would disagree with lax command authority?

Captain MOOSALLY. I do not think—no, sir, I do not think there has been any lax command authority since I have been in command of *Iowa*.

Chairman NUNN. Captain, let me see if I can summarize your testimony, and you tell me where I go wrong if this is incorrect.

Captain MOOSALLY. Yes, sir.

Chairman NUNN. I am not trying to capture the whole. I am just trying to summarize these particular points.

You still believe that there was no employment plan for the *Iowa*?

Captain MOOSALLY. At the time that I gave the testimony and came on the ship, that is correct.

Chairman NUNN. Second, the ship was not properly supported by the Navy in both officer and enlisted manning?

Captain MOOSALLY. I would put the emphasis on the enlisted area, Mr. Chairman, in the quality area, not numbers, but quality.

Chairman NUNN. Quality.

Captain MOOSALLY. By that I mean the chief petty officer, the first class petty officer and the second class petty officer. That is the area that I was complaining about the most, because that is the area that you need to have what I call deck-plate leadership.

Chairman NUNN. At the time of your testimony, there was a lack of appreciation in the chain of command, at least on the east coast, for the capability and utilization of the battleships?

Captain MOOSALLY. Well, I would say only as reflected in our employment schedule.

Chairman NUNN. Thank you. Senator Dixon.

Senator DIXON. I just want to clarify two more things, and then I will conclude, Captain.

I am told, and I would like you to correct me if I am in error, that the guns are supposed to be cleaned after every firing, but that it is a dirty job and that many times guns, in fact, are not cleaned after every firing. Is that a fair statement?

Captain **Moosally**. That is not true. That is categorically not true. As a matter of fact, these gunnersmates take great pride in getting out there and swabbing out those barrels after every shoot.

Senator **Dixon**. So, if any testimony is in the record here to that effect, it is in error?

Captain **Moosally**. As far as I am concerned it is, yes, sir.

Senator **Dixon**. All right.

I am told that there is testimony that indicates that the rammerman had only been trained for 2 days prior to the April 19 firing.

Captain **Moosally**. No, I do not agree with that.

Senator **Dixon**. Okay.

Captain **Moosally**. If I can find it here, that individual had been in training I believe since January, had been in five—I have got it right here—he had been in five gun shoots and shot 13 rounds. And if you talk to the individual who is out of the Navy now who trained him, who NIS interviewed, he indicated he was one of the best rammermen that he had trained.

Senator **Dixon**. Is it possible there could be a problem with the rammer that would not be reported to you? I mean that would not get to that high a level? I do not know, I am just asking.

Captain **Moosally**. Everything is possible, but I certainly do not think there was trouble with the rammer.

Senator **Dixon**. Well, I want to thank you, Captain Moosally, for your very forthright testimony. I want to thank the Chair for the very interesting hearing that we have had, and for his dedication to arriving at the truth in these matters, and congratulate him on the job he has done.

Chairman **Nunn**. Thank you very much, Senator Dixon.

One final question, Captain, if I can capture your testimony on the crucial finding as you described it. Do you agree with the finding of the Navy that the explosion occurred as a result of a wrongful, intentional act?

Captain **Moosally**. Yes, sir.

Chairman **Nunn**. But you do not believe you have the knowledge to come to a conclusion as to who committed that act?

Captain **Moosally**. That is correct. Yes, sir.

Chairman **Nunn**. Thank you.

Senator **Dixon**. If I may follow that up. Why would you come to the conclusion that it has to be a wrongful, intentional act, in view of all the complicated circumstances surrounding the firing of these guns, and the fact that accidents of this kind have historically happened in the past?

Captain **Moosally**. Well, they have not historically happened on the *Iowa*-class battleship.

Senator **Dixon**. But they have historically happened. It happened with other battleships, Captain. The facts are in the record.

Captain **Moosally**. Yes, sir, I am just talking about *Iowa*-class battleships.

Senator **Dixon**. Well, I understand that. I did not say the *Iowa*.

Captain **Moosally**. I am saying *Iowa*-class.

Senator DIXON. Are you saying that this accident never happened before?

Captain MOOSALLY. This type of accident has never happened on an *Iowa*-class battleship is what I am saying.

I come to that conclusion based on my observations of the procedure up there in loading that gun. And that is the only conclusion I can come to.

Senator DIXON. Would it occur to you that it would be easier for the Navy to suggest that someone had intentionally done this than to live with the fact that it is an accident that can occur, has occured in the past, and may very well occur again in the future?

Captain MOOSALLY. No, sir, I have not. I hope that is not the case. I do not think it is the case.

Senator DIXON. I would warrant that a majority of the American public believes it to be the case.

Captain MOOSALLY. Well, I must say this, that I would not have gotten—number one, in August, when we fired the rounds after the moratorium, I would not have ordered my men in there and I would not have gone in there—and I went in there with them. And that is how much faith that I had and we had as a crew in those guns, in their safety, in our equipment, and in our own training. And, believe me, I would not have ordered our men to go back in those turrets had I thought it was an accident that could happen again.

Chairman NUNN. Captain, could I ask you one final question that is not related to this specific incident, but goes to your experience at sea, having just been there, having gone through a lot of the exercises, as well as been part of a deployment plan in a crucial area of the world?

Captain MOOSALLY. Yes, sir.

Chairman NUNN. I want to say that I am proud of all the men and women on your ship for what you all have been able to do, particularly since this tragedy happened. I think to go back out in those circumstances is most commendable and I congratulate you and your whole crew on that.

Based on your own experience, based on the problems that you have had in manning and so forth, which we have gone through this morning, do you believe now that we have a Navy that has too many ships to properly man?

Personal opinion.

Captain MOOSALLY. Personal opinion? My personal opinion is we are the best Navy in the world, number one. I do not think there is any question of that. And our enlisted people are the heart of that.

Chairman NUNN. I agree with that.

Captain MOOSALLY. Because they are the technicians and the operators, and that is what sets us apart from the Soviets and other navies. They are the backbone of the fleet.

My biggest concern is the high turnover rate that we have on ships, which approximates 45 percent. In our case it was 46 percent. That concern is only that you have to pay constant attention out there, because training has to go on and on and on. Forty-six percent to us last year equated to over 600 new faces on the *Iowa*.

So, the CO has to be more involved today than at any other time since I have been in the Navy, has to be tremendously involved in every evolution.

Every evolution has a risk be it a gun shoot or coming alongside an oiler for refueling, and certainly going into a port where you are going into shallow waters, going through a strait, any evolution that has risk in it.

But, you cannot be everywhere, all the time, and this is where these leaders that I was talking about before, the E–7, E–6, E–5 and above become important, because they have got to carry that policy that you have about direct involvement and supervision all over the ship.

So, I would say that that is my major concern as a commanding officer, that it seems like you have really got to be tremendously involved in every evolution, more so than ever before because of the fact that you have a pretty high turnover in people.

Chairman NUNN. You are saying we do not have enough senior enlisted personnel in the qualifications you need?

Captain MOOSALLY. I can say I did not have enough when I first came to the ship. I certainly have them today. And I cannot speak for the entire Navy, whether that is a problem Navy-wide or not.

Chairman NUNN. Is it a problem you think ought to be a concern of the Navy at this juncture?

Captain MOOSALLY. I think the turnover rate ought to be of concern. I do not know what to do about that, and I cannot speak to the ratings as far as how many chief petty officers we have or E–6, E–5 petty officers we have for the fleet.

Senator DIXON. Mr. Chairman, would you indulge me by making one final comment.

Chairman NUNN. Certainly.

Senator DIXON. I would simply want to say as you and the Captain have both said, that we have the greatest Navy in the world. We have the finest officers and fighting men and crews, and everyone believes that, and there is a risk, and the American public accepts the fact that there is a risk.

I think the problem that we have here is that it strains the intelligence of most people to draw a conclusion that one person intentionally carried out this act that brought about this terrible tragedy when so many thousands of different things could have brought about this result, and I do not believe that the American public generally believes that one individual intentionally caused this act that brought about this great tragedy.

I think most people believe there are a variety of things that could have caused the accident. This Senator thinks there are a variety of things that could have brought about the accident, but I do not know why we have to tell the American people that we draw a conclusion that flies so strongly in the face of what I consider to be all of the facts in the case. I say that with due respect to every person involved in the investigation.

We have a great Navy, great people in it, and we want to continue to be the greatest naval power in the world. I support that enthusiastically. We do not need, I think, to come to the conclusion that one person intentionally did this to continue to support having these battleships, these 16-inch guns in a great Navy.

Chairman NUNN. Thank you, Senator Dixon. We will be hearing more on this this afternoon from the FBI. We will be getting right to the point that Senator Dixon just alluded to—as to whether the evidence is sufficient to establish a wrongful act, number one, and second, was the evidence sufficient to establish a probability that the Navy concluded putting that act on the responsibility of one person.

Captain, I hope you are able to get a few days off now. I know that the weekend was one of preparation.

Captain MOOSALLY. Thank you, Mr. Chairman. I appreciate being here.

Chairman NUNN. I hope you will express our appreciation to all of the men and women in your command for the job they have done for us.

Captain MOOSALLY. Thank you, Mr. Chairman.

Chairman NUNN. We will be here at 1:30 this afternoon. We had announced at 2 o'clock. It will be at 1:30 this afternoon with the FBI.

[Whereupon, at 11:28 a.m., the committee adjourned, subject to the call of the Chair.]

REVIEW OF THE DEPARTMENT OF THE NAVY'S INVESTIGATION INTO THE GUN TURRET EXPLOSION ABOARD THE U.S.S. "IOWA"

MONDAY, DECEMBER 11, 1989

U.S. SENATE,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

The committee met, pursuant to notice, at 1:32 p.m., in room SH-216, Hart Senate Office Building, Senator Sam Nunn (chairman) presiding.

Committee members present: Senators Nunn, Dixon, Warner, and Cohen.

Committee staff members present: Arnold L. Punaro, staff director; and Richard D. DeBobes, counsel.

Professional staff member present: Robert G. Bell.

Minority staff members present: Patrick A. Tucker, minority staff director and counsel; and Mark B. Robinson, professional staff member.

Staff assistants present: Kelli J. Pronovost and Mickie Jan Wise.

Committee members' assistants present: Charles C. Smith, assistant to Senator Dixon; Milton D. Beach, assistant to Senator Glenn; Terrence M. Lynch, assistant to Senator Shelby; Dale F. Gerry, assistant to Senator Cohen; and Charles G. Pearcy, assistant to Senator Lott.

OPENING STATEMENT OF SENATOR SAM NUNN, CHAIRMAN

Chairman NUNN. The committee will come to order.

The committee meets this afternoon for the third of a series of hearings on matters associated with the explosion on April 19, 1989, in the center gun of turret II on board the U.S.S. *Iowa* which resulted in the deaths of 47 naval personnel.

The committee heard this morning from Capt. Fred Moosally, the commanding officer, U.S.S. *Iowa.* Last month, we heard from Rear Adm. Richard Milligan, the Navy's investigating officer, and from other Navy witnesses who assisted in the investigative report.

This afternoon, we will hear from Mr. Anthony E. Daniels, the Assistant Director for the FBI for Training and from special agents Richard L. Ault, Jr., and Robert R. Hazelwood. Mr. Ault and Mr. Hazelwood prepared the FBI's "equivocal death analysis" which contains their opinion, quoting from that, "Clayton Hartwig died as a result of his own actions, staging his death in such a fashion that he hoped it would appear to be an accident." The equivocal death analysis was a key element in the Navy's opinion that GMG2

Hartwig most probably committed the wrongful intentional act that took his own life and the lives of 46 other naval personnel.

We will also hear from Mr. Kenneth W. Nimmich, who is the Section Chief of the Scientific Analysis Section of the FBI's Laboratory Division. The FBI laboratory conducted an analysis of the rotating band from the projectile that was in the barrel on April 19 in an attempt to determine the presence of any foreign material. The FBI's analysis was inconclusive.

As I indicated this morning, at the committee's request, Sandia National Laboratories will be conducting an independent analysis of the remainder of the rotating band.

We will proceed this afternoon by first hearing from Mr. Daniels and special agents Ault and Hazelwood on the equivocal death analysis, and then, after we are finished with their testimony, including questions, we will proceed to Mr. Nimmich on the technical analysis.

Senator Warner, do you have any comments?

Senator WARNER. Just briefly, Mr. Chairman.

Gentlemen, I have worked over your statements here, and I urge you to provide as much background as possible for what it is you are about to provide to the committee.

I spent 5 years as an Assistant U.S. Attorney and tried many, many cases. This type of evidentiary material is relatively new in the trial of cases, and of course this is an administrative proceeding of the Navy, but nevertheless there is a certain parallel.

A lot of people are listening to this, and I am concerned about the families of the victims, concerned about the families of those who are still at sea, and I just hope that you can convey as clear a picture as possible, without being too technical, so that a lot of people have a very broad understanding about your contribution to this case.

Thank you very much.

Chairman NUNN. Thank you, Senator Warner. Mr. Daniels, I believe you are going to give us an introductory background and then we will hear from Mr. Ault and Mr. Hazelwood, is that correct?

Mr. DANIELS. Yes, sir, Mr. Chairman.

Chairman NUNN. We are glad to have you.

STATEMENT OF ANTHONY E. DANIELS, ASSISTANT DIRECTOR, TRAINING DIVISION, FBI; RICHARD L. AULT, JR., Ph.D., SPECIAL AGENT, TRAINING DIVISION, FBI; ROBERT R. HAZELWOOD, SPECIAL AGENT, TRAINING DIVISION, FBI

Mr. DANIELS. Thank you, sir. Glad to be here. I have submitted a copy of this statement for the record, sir, and with your permission I would like to just give a summary of that statement.

Chairman NUNN. Without objection, it will be included as part of the record.

Mr. DANIELS. Thank you, sir. My name is Anthony E. Daniels of the Federal Bureau of Investigation, and I am the Assistant Director in charge of the FBI Training Division, which is located on the Marine Corps base in Quantico, Virginia.

By way of background, the training division is responsible for conducting and coordinating all training for FBI personnel. It also provides training assistance upon request to local, county and State law enforcement personnel throughout the United States. In addition to providing investigative and operational support to the field, the training division historically has functioned as an international forum for seeking and identifying solutions to current and emerging problems facing the entire criminal justice system.

To assist the Academy staff in the continued development of quality training and educational programs, the training division has maintained a formal affiliation with the University of Virginia since 1972. In addition to providing course accreditation and academic certification for instructor personnel, the University of Virginia provides technical and instructional resources.

In conjunction with the training division's nation-wide efforts to address the violent crime issue, the National Center for the Analysis of Violent Crime was established at the FBI Academy in July 1984. This Center is a law-enforcement-oriented behavioral science and data processing center designed to consolidate research, training and investigative/operational support functions for the purpose of providing expertise to any legitimate law enforcement agency confronted with unusual, bizarre and/or repetitive violent crime.

Through the expertise of its staff of crime analysts, psychologists, sociologists, criminologists, political scientists, computer scientists, and police specialists, the Center brings a multidisciplined approach to a wide variety of investigative problems. The Center is an integral part of the FBI Academy at Quantico, Virginia, and its members are adjunct faculty with the University of Virginia.

Research activities include multidisciplinary studies in serial and violent crimes such as homicide, rape, sexual sadism, child abduction, arson, and counterintelligence matters. Joining in such research projects with the staff of the Center are faculty from major universities, members of the mental health and medical professions, and other law enforcement representatives.

The Center provides investigative support to Federal, State, county, and city law enforcement agencies through its criminal investigative analysis program. This program provides the support, through consulting on major violent crimes, such as the Atlanta child murders, Tylenol poisonings, and the Green River serial murder case, constructing profiles of unidentified offenders, planning case investigative strategies, providing expert testimony, and furnishing interview techniques.

Now, having outlined the goals and missions of the Academy and the Center, let me provide you with the insight and definitions that would be applicable in this matter. As I indicated, the Center's research and assessment activities are provided in a wide variety of cases, including equivocal deaths. An equivocal death is a death whose manner (homicide, suicide or accident) has not been resolved through normal investigative activities.

Another aspect of our process is indirect personality assessment, a behavioral oriented analysis of all available material about an individual. This process is included in equivocal death evaluations.

It should be noted that this equivocal death analysis should not be confused by another service provided by the National Center, criminal personality profiling, currently defined as criminal investigative analysis.

Criminal investigative analysis is a process which would review and analyze, at the request of the law enforcement agency involved, crimes of violence in which the offender has not been identified. The focus of criminal investigative analysis includes a review of the crime scene photographs, autopsy report and completed investigation conducted by the submitting law enforcement agency. Its objective is to provide the investigative agency with characteristics and traits of the unidentified offender.

In equivocal death, there is a known decedent, and information is available about the deceased. The equivocal death analysis specifically focuses on determining the manner of death: homicide, suicide or accident.

When the National Center provides these services to law enforcement agencies, the only restriction imposed by the FBI on the use of the report is that dissemination be limited to individuals or agencies having a legitimate investigative or prosecutorial interest in the matter.

I'd like to introduce two members of my staff to you, supervisory special agents Richard L. Ault, Jr., Ph.D., and Robert R. Hazelwood. These individuals are staff and faculty members assigned to the National Center. Normally, an individual case would be assigned to one supervisory special agent. In this particular case, because of the significance of the matter, Dr. Ault and Mr. Hazelwood were requested to conduct separate analyses and then jointly provide an assessment.

With your permission, I would like to ask Dr. Ault to provide an overview of the process of this specific analysis, following which we would be happy to respond to any questions you may have.

[The prepared statement of Mr. Daniels follows:]

PREPARED STATEMENT OF ANTHONY E. DANIELS, ASSISTANT DIRECTOR, TRAINING DIVISION, FEDERAL BUREAU OF INVESTIGATION

Good morning/afternoon ladies and gentlemen. I am Anthony E. Daniels of the Federal Bureau of Investigation (FBI). I am in charge of the FBI Training Division which is located on the Marine Corps Base in Quantico, Virginia.

The training division is responsible for conducting and coordinating all training for FBI personnel. It also provides training assistance, upon request, to local, county, and State law enforcement personnel throughout the United States. In addition to providing investigative and operational support to the field, the training division historically has functioned as an international forum for seeking and identifying solutions to current and emerging problems facing the entire criminal justice system.

In 1972, a new and modern academy complex consisting of 401 acres, 23 major buildings, six firearms ranges and dormitory space was completed. The FBI Academy personnel complement now consists of 127 special agents and 321 support and wage grade employees.

To assist the academy staff in the continued development of quality training and educational programs, the training division has maintained a formal affiliation with the University of Virginia since 1972. In addition to providing course accreditation and academic certification for instructor personnel, the University of Virginia provides technical and instructional resources.

Assignment as an FBI Academy faculty member requires 5 years' investigative experience as a law enforcement officer. Depending on the nature of the instructional or research responsibilities, selected staff members must also possess a graduate degree or other unique professional preparation in specific academic disciplines.

In conjunction with the training division's nationwide efforts to address the violent crime issue, the National Center for the Analysis of Violent Crime (NCAVC) was established at the FBI Academy in July, 1984. The NCAVC is a law-enforcement-oriented behavioral science and data processing center designed to consolidate research, training, and investigative/operational support functions for the purpose of providing expertise to law enforcement agencies confronted with unusual, bizarre and/or repetitive violent crime.

Through the expertise of its staff of crime analysts, psychologists, sociologists, criminologists, political scientists, computer scientists, and police specialists, the Center brings a multidisciplined approach to a wide variety of investigative problems. The Center is an integral part of the FBI Academy at Quantico, Virginia, and its members are adjunct faculty with the University of Virginia.

The educational and training activities of the Center includes courses, seminars, symposia, and conferences, as well as a 10-month fellowship for police officers in criminal investigative analysis. The courses and seminars are conducted at the FBI Academy and at a variety of locations throughout North America; the fellowship, conferences, and symposia take place at the FBI Academy.

Research activities include multidisciplinary studies in serial and violent crimes such as homicide, rape, sexual sadism, child abduction, arson, and counterintelligence matters. Joining in such research projects with the staff of the Center are faculty from major universities, members of the mental health and medical professions, and other law enforcement representatives.

The Center provides investigative support to Federal, State, county, and city law enforcement agencies through its Criminal Investigative Analysis Program (CIAP) and the Violent Criminal Apprehension Program (VICAP). The CIAP provides this support through consulting on major violent crimes, such as the Atlanta child murders, Tylenol poisonings, and the Green River serial murder case, constructing profiles of unidentified offenders, planning case investigative strategies, providing expert testimony, and furnishing interview techniques. Additional support is provided through the use of indirect assessment in other selected cases.

Having outlined the goals and mission of the Academy and of the Center, let me provide you with the insight and definitions that would be applicable in this matter. As I indicated, the Center's research and assessment activities are provided in a wide variety of cases including equivocal deaths. An equivocal death is a death whose manner (i.e., homicide, suicide, or accident) has not been resolved through normal investigative activities. Another aspect of our process is indirect personality assessment, a behavioral oriented analysis of all available material about an individual. This process is included in equivocal death evaluations.

It should be noted that an equivocal death analysis should not be confused with another service provided by the National Center, that is, criminal personality profiling, currently defined as "criminal investigative analysis." Criminal investigative analysis is a process which would review and analyze, at the request of the law enforcement agency involved, crimes of violence in which the offender has not been identified. The focus of criminal investigative analysis includes a review of the crime scene photographs, autopsy report, and completed investigation conducted by the submitting law enforcement agency. Its objective is to provide the investigative agency with characteristics and traits of the unidentified offender. In an equivocal death there is a known descendent and information is available about the deceased. The equivocal death analysis specifically focuses on determining the manner of death (i.e., homicide, suicide, or accident).

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I would like to introduce two members of my staff to you, Supervisory Special Agents Richard L. Ault, Jr., Ph.D., and Robert R. Hazelwood. These individuals are staff and faculty members assigned to the National Center. Normally, an individual case would be assigned to one supervisory special agent. In this particular case, because of the significance of this matter, Dr. Ault and Mr. Hazelwood were requested to conduct separate analyses and then jointly provide an assessment.

With your permission, I would like to ask Dr. Ault to provide an overview of the process of this specific analysis.

STATEMENT OF RICHARD J. AULT, JR., Ph.D.

Dr. AULT. With your permission, I would like to just expand a little bit on some of the remarks of Mr. Daniels and give you a little history of the unit to lay the groundwork for what we do.

Our unit was established formally in 1972, as he said, and our original purpose was teaching police officers and law enforcement officers from around the world the concept of behavioral science as it applies in a practical way to law enforcement investigations.

Needless to say, with police officers you sometimes get a skeptical bunch, and what they started doing was asking us to apply what we were teaching them to unsolved cases, usually bizarre cases, and inevitably unsolved old cases.

We did well at it and as we began to grow with this business of looking at how you applied behavioral sciences to a homicide investigation, to rape cases and so forth, we began doing something that I think even today is very unusual in the behavioral science field. We began looking at crime scenes and trying to describe the kind of individual who might have done this sort of crime. That originally was called profiling. That is what we did from 1975, when I got there, and 1976 when Mr. Hazelwood got there.

We became very successful at it. At the same time, we started research in those areas, particularly homicide—what we call serial murders today—violent crimes like rape, arson, child molestation and so forth. At the same time, we began moving into more and more the limelight with this process we found that there was another step that we had to take.

People would find out that we could do pretty well, that we would match our profiles, as it were, to the crime scene very well, that it appeared to be a good match in many cases, and it appeared to be almost like a mystical process.

They assumed by our results that we knew what we were doing. The next step, of course, was could we tell them, when they find a suspect, about interviewing the suspect or about doing whatever they had to do to get the suspect to talk, or how could we best talk to this individual.

That process is indirect assessment; that is, taking information about individuals without talking to them and applying that information to learn as much as you can about the person; to see what kind of individual they are, what makes them tick.

The process of equivocal death analysis—that is, looking at a death to determine the manner, whether or not it was a suicide, an accident or homicide—utilizes indirect assessment as well.

So what we began to do, then, was grow in that regard, and we found that we were not only doing profiling but that we were doing other things as well. Our unit is a fairly small unit, but anything that revolved around unusual behavior came to us. Once the National Center was opened, then we began to get even more of a broad international picture of violence in all of its forms and aspects.

We apply our skills in teaching and in practical ways to things as: hostage negotiations (we no longer do that now); hypnosis; counseling; interpersonal violence such as rapes and child abuse; and violent crimes, the serial murders I mentioned, kidnap, homicides, poison deaths and equivocal deaths. We are also involved in both consultation and research in crimes like arson, as Mr. Daniels mentioned earlier. As he said, we also engage in the research. We found early on that we just do not find in academia the research that we need. The academic community does not have the depth that we needed to provide us with answers that we must have when we take this behavioral science and put it in a practical format.

So we began to initiate our own research. With the orientation that we had, we felt that a lot of our research was best applied through the methodology of going into the prisons and talking to the offenders themselves, obtaining the answers from them in a practical way. We are not talking about a clinical application particularly. We are talking about practical things; how an individual who kidnaps children can lure a child out of a shopping mall, these sorts of things.

As a result, in addition to the arsons and the child molestation, we got involved in research on assassinations, poisonings, sadistic murders and so forth.

Our expertise is applied when other leads are finished. We are a tool. We are a very small tool in the repertoire of a detective. We are not detectives ourselves. We do not pretend to be. We are professionals in the area of behavioral sciences. When they begin to run out of other things to do, standard types of investigative techniques, then they turn to us, so that when they have questions about people that they need answered, when they have these kinds of assessment processes that they need to do, they come to us.

The process is very simple by and large, if I may sort of divorce myself from this business of profiling and talk about the assessment job itself or the equivocal death analysis.

It is very simple. We work directly with whoever the investigators are. We sit down with them when it is at all possible, and we usually insist that we do that. We view all the evidence that they have to provide us, and then we form an overview. Once we have formed an opinion and overview, then we will look back and see what it takes to support it. We will go back to the formalities of the paperwork, as it were.

We sometimes arrive at our conclusions by different roads, but the interrater reliability of those roads is very high. We find that we agree generally in most areas when we are doing these kinds of analyses. We are not compelled to arrive at a conclusion; that is, the idea is that the process of say, indirect assessment is a problem-oriented process. They have to come to us with some kind of a problem to be resolved, "can you tell me if this death is a suicide, homicide or an accident," or "can you tell me if this individual will do such and such."

We are not required to give an answer to that question. If in the course of our analysis of the evidence we see things that we do not believe lead us in a direction that they are thinking of, we do not mind saying that. We are disinterested observers. So if they are asking, for example, "was it a death by suicide or by homicide" and we see clearly in our opinion that it is an accident, then we will so state.

The unit, as Mr. Daniels said, is made up of special agents who have at least 5 years of experience and a minimum of a master's degree in the subject that they teach.

Senator COHEN. Mr. Chairman, may I ask just one question for clarification?

Chairman NUNN. Surely.

Senator COHEN. It is unclear to me. You are saying that the investigators come to you after they have exhausted their normal investigative techniques?

Dr. AULT. Yes, sir.

Senator COHEN. Is that the case here? They come to you after they have gone through their analysis and they are in doubt, or do you work with them up front?

Dr. AULT. We can do it anywhere along the way.

Generally speaking, though, they are pretty well through. Our product requires forensic evidence. We have to have as much forensic evidence as the investigation has developed. For example, in a normal homicide, if there is such a thing, you would want to know what the blood type was. You would want to know what the autopsy protocol reads and so forth. When I say toward the end of it, I am saying that most of the leads that are normal or standard, have been covered, and now they are looking for other directions. They have run out of other leads.

Senator WARNER. Mr. Chairman, might I also just ask a preliminary question?

How do the criminal courts treat your work product? Is it evidence? Is it opinion? In this instance, how did the Navy treat your work product?

Dr. AULT. Our product, as it says in there, is strictly opinion based upon the expertise that we have acquired over the years of doing this and our own backgrounds. We give opinions.

Chairman NUNN. Are you called on to testify in various criminal proceedings?

Mr. HAZELWOOD. Yes, sir. I have testified in four murder trials as an expert in violent death and equivocal death analysis.

Chairman NUNN. When you do testify, you have the attorney for the State or whoever is using you go through your qualifications, establish your credentials as an expert in this area, I assume, and then you state your opinion as an expert witness?

Mr. HAZELWOOD. Yes, sir. We are also cross-examined by defense attorneys, and the judge makes a ruling as to whether or not we may testify as expert witnesses. In every instance where I have testified, I have been ruled an expert witness.

Senator WARNER. Thank you, Mr. Chairman.

Dr. AULT. In this particular case we were contacted by the members of the NIS, the investigators and one of the officers with the Naval Investigative Service who asked that we take a look at the evidence that they had and provide them with answers to some of the questions that they posed, three of which included at that time——

Senator COHEN. Would you specify the time when you were first contacted?

Dr. AULT. Surely. The first time was May 23, 1989. The contact was prior to that, but we had met with them the first time on May 23, 1989. The second time was June 2, 1989. The third time was June 15, 1989.

Chairman NUNN. All right. Go ahead.

Dr. AULT. Thank you.

During the course of that, we sat down with them and went over all of the evidence that they had, which included the information concerning the physical layout of the turret in which the explosion occurred and the physical location of each man in the gun room, letters written by GMG2 Clayton Hartwig and others, several photos, copies of the writings by GMG2 Hartwig to one of his shipmates, the results of the interview with the family and associates of the victim and Hartwig's personal history as well as activities leading up to his death. Those were provided in the form of NIS reports, transcripts from taped interviews, pictures, photographs and so on.

Senator DIXON. May I make an inquiry at this point, Mr. Chairman?

Chairman NUNN. Certainly.

Senator DIXON. If I could clarify that, Dr. Ault. If I understand what you are saying, from the moment of the Navy's intercession with your bureau about this question, all of the information they gave you, the exhibits which I understand to be some 25 statements they made, and other things related to Mr. Hartwig. Is that true?

Dr. AULT. No, sir, not all Mr. Hartwig. We had some related to Mr. Truitt as well.

Senator DIXON. Truitt and Hartwig?

Dr. AULT. Truitt and Hartwig; I believe so.

Senator DIXON. So from the inception here of the relationship with the Naval Investigation Team, you understood that their inquiry directed its attention to those individual players?

Dr. AULT. We were told originally that they had ruled out accident as a cause of death.

Senator DIXON. You were told they had already ruled out accident?

Dr. AULT. Yes, sir.

Senator DIXON. May I follow up with one more question, if the Chair will indulge me?

I do not at all question your qualifications or those of Mr. Hazelwood and others, which are clearly established, but as an old trial lawyer I feel compelled to ask you, is it not a fact that you do not make the final decision, the jury makes the final decision about the facts and determines guilt, innocence and other things? You present your expertise about various questions relating to the subject matter upon which you have that special qualification?

Dr. AULT. This is an opinion, yes. That is just what we have said, yes, sir.

Senator WARNER. Now Mr. Chairman, the Navy in no way restricted you from pursuing another avenue of thought or hypothesis?

Dr. AULT. As I said earlier, sir, we are not compelled to parrot what the Navy may want us to parrot.

Senator WARNER. You had a free hand in taking the facts that were provided you and making such conclusions and opinions as you wished?

Dr. AULT. Absolutely, yes, sir.

Chairman NUNN. I suggest we go ahead and let him complete his presentation. I believe he will have some of these questions answered. Then we will come back.

Dr. AULT. Let me just go ahead and finish this.

As I said, we looked at the case. They had three concerns. We, of course, addressed those concerns first. The first was whether it was a possibility of homicide by one of his shipmates. The second was the potential for a suicide/homicide, and the third was, of course, a suicide by Mr. Hartwig.

We eliminated the first two. There is a complete report, as I understand, of our opinion in front of you that goes into those reasons. We concentrated on the third because we were told that there was no accident involved.

One of the first things that we do in this equivocal death analysis is pay attention to the forensic evidence. It is a maxim for us that we do not run in the face of that evidence. Then we begin to concentrate on Mr. Hartwig.

Looking at his "picture," looking at everything that we could find about him and taking from that and painting a "portrait," as it were, of him the way we see him based on the material that was presented to us. Mr. Hazelwood has a summary that is based on the report that you have in front of you. I would like to have him read from that. Perhaps that will lay some of the background for you and state some of the reasons why we have arrived at our opinion.

Chairman NUNN. Fine. Thank you. Mr. Hazelwood.

STATEMENT OF ROBERT R. HAZELWOOD

Mr. HAZELWOOD. The victim and 46 other men died as a result of the explosion, which occurred, as you know, in turret number 2 aboard the U.S.S. *Iowa*. The naval authorities, when they came to us, had ruled out the possibility of this being an accidental explosion, and we proceeded with that point in mind.

And again, as Dr. Ault has stated, we tried to determine, number one, whether or not this was a homicide on the part of one of Hartwig's shipmates; number two, whether this was a suicide and homicide attempt by Hartwig; and finally, whether it was a suicide on the part of Hartwig.

It was our opinion that the least likely scenario involved a shipmate in a homicide directed at Hartwig. We felt that was the least likely scenario.

The second scenario involved Hartwig, with the secondary goal of killing his shipmates. We felt it was immaterial as to whether or not he intended to kill anyone else, he did in fact kill other people, in our opinion.

So, therefore, what we had to address was, did he intend to kill himself with the explosion, and if so, why?

We arrived at the conclusion that he did.

I have the summary of the victimology of the person involved, Hartwig, if you would like for me to go into that.

Chairman NUNN. I think so, yes.

Mr. HAZELWOOD. The victim, Clayton Hartwig, was a 24-year-old single white male, who was a 6-year veteran of the U.S. Navy, who had attained the rank of Gunnersmate Second Class. He was assigned as a gun captain in turret number two aboard the U.S.S. *Iowa* at the time of his death.

He was the youngest of three children, born 12 years after the second child. Both of his siblings were female. One of his sisters reported that during his childhood he spent the majority of his time in his room, and was considered to be a loner with no friends, and was largely estranged from other family members.

He was non-athletic and preferred solitary pastimes. She stated that she had never known him to lose his temper, and that over the years, as a youngster, he had accumulated a knife collection—combat-style knives—a somewhat smaller gun collection, and a large number of Soldier of Fortune and other adventure-type magazines.

He also owned many books on World War II and warships. He had no steady girlfriends. And from the information available, it appears as though he was asexual in his developmental years.

While in the 11th grade at a private school, he formed his first close friendship with a male who was in the 9th grade. This friend purportedly took a knife from Hartwig, who was making a suicidal gesture with the weapon. Hartwig considered that this action had saved his life, and for that he owed a great deal to his friend.

He wrote a will leaving all of his earthly goods to the friend, which was found by NIS agents, Naval Investigative Service agents, subsequent to Hartwig's death, in one of his Bibles in his room in his parent's home.

After joining the Navy, Hartwig gave $200 a month to his high school friend for approximately 1½ years. He ceased giving that money to—it was on a monthly allotment form—he ceased giving that money to his friend when the friend advised him that he had sexual relations with a young female who was a mutual acquaintance of theirs. Hartwig reportedly took the news very badly, and stopped giving the money to that individual.

After graduating from high school, he joined the Navy. As a young adult he was reticent in close personal relationships with either men or women, preferring to utilize letters and notes for intimate communication.

He would correspond with those people he liked and considered to be friends. His letters reflect a great deal of egocentricity, and he described himself as being shy.

While in the Navy, he was described as not sufficiently aggressive to be a good leader, immature, and lacking in other leadership skills. He had low self-esteem and was unable to verbally express his emotions.

At the time of his death he had a total of $34 in the bank, very few civilian clothes, and a poorly maintained vehicle.

While in the Navy he developed only two close friends, one whom he knew while at Guantanamo Bay from 1984 till 1986, and the other with whom he served aboard the U.S.S. *Iowa*.

In January 1988, Hartwig took out a $50,000 double-indemnity, life insurance policy and named his friend aboard the *Iowa* as the beneficiary. That policy was in effect at the time of Hartwig's death.

This friend married in December 1988 and Hartwig was reported to be deeply depressed as a result of that marriage. Hartwig stated in his letters, and interviews with others aboard the *Iowa* after the explosion confirmed the fact that he and his friend ceased all communication with one another, other than Hartwig giving orders in the line of duty. However, he did not cancel the life insurance policy.

He was due to reenlist or be discharged from the Navy in late 1989, but had not indicated his intentions to the personnel responsible for reenlistment.

He was a shy, lonely individual who lived a fantasy life of power and authority far different from the reality of his actual life. He was much more adept at communicating with people via the written word than in person, and was not known to have been involved in an intimate way with any of his female associates.

We arrived at the following conclusions: that he was a loner, and that can be documented by several statements. Even though he wrote letters to other women, he had only three close female acquaintances. He was dissatisfied with his life as he lived it.

We believe that he had good reasons for not returning from the cruise aboard the *Iowa* in May 1989. We believe that he had good reasons in his own mind for damaging and potentially sinking the U.S.S. *Iowa*. We believe that he had a history of immature reactions to change in his life and interpersonal problems.

He was also known to carry a grudge against those whom he believed wronged him. We believe that he was experiencing a number of stressors at the time of his death. And we believe that Hartwig had suicidal ideation.

Finally, we believe that GMG2 Hartwig possessed the knowledge, ability and opportunity to cause the explosion that occurred aboard the U.S.S. *Iowa*.

It is our final opinion that he did in fact commit suicide and hoped that his death would appear to be an accident.

Chairman NUNN. Thank you, Mr. Hazelwood.

Let me lead off here. In coming to your conclusions, you state that he had reasons or motives, I am not sure of the exact words, for sinking the U.S.S. *Iowa*.

That is sort of the bottom motivation. But in your recitation of facts I did not hear facts that linked up to that conclusion.

Mr. HAZELWOOD. Yes, sir, we have that right here.

Chairman NUNN. What do you base that on?

Mr. HAZELWOOD. Okay, sir, if I may have 1 minute to find it right here.

Chairman NUNN. What do you base his suicidal——

Mr. HAZELWOOD. Ideation?

Chairman NUNN. Yes.

Mr. HAZELWOOD. All right, sir. Suicidal ideation, first of all, he had made a suicidal gesture at the age of 17 or 18, and he had discussed suicide——

Chairman NUNN. How old was he at the time of death?

Dr. AULT. Twenty-four.

Mr. HAZELWOOD. Twenty-four years of age.

Chairman NUNN. All right, this was 7 years before?

Dr. AULT. Yes, sir.

Mr. HAZELWOOD. Yes, sir.

Dr. AULT. From our perspective, however, that is given a lot of weight. The fact that he was thinking even back then or even toying with it, however lightly, is very important.

Mr. **Hazelwood**. He also discussed suicide with a sailor named Truitt and a sailor named Smith aboard the U.S.S. *Iowa*.

Second, approximately 1 week prior to his death he discussed suicide and various methods to commit suicide with David Smith. That can be found in the interview of May 28, 1989.

Third, a female acquaintance of his advised that the last letter she received from Hartwig closed with, "Love always and forever, Clayton." He had previously closed his letters with simply, "Clay."

He also specifically told her in that letter, "I am sorry I did not take you home to meet my mother." Also, in an interview with Kendall Truitt, Truitt stated that when Hartwig discussed killing, he talked in terms of extreme violence, with total annihilation and mutilation.

When asked by a shipmate what his goals in life were, Hartwig told him that his goal in life was to be a petty officer in the Navy and that he had achieved that goal. Having achieved his final life goal he apparently could not envision a future for himself.

On May 22, 1989 another female acquaintance, a casual friend, advised she had met Hartwig approximately 4 years previously, and they had exchanged three or four letters, but had not been in touch in the past year. A few days after the explosion, she unexpectedly received a letter from Hartwig, and remembers that he "did seem down," and that he "did not talk about his future, which he normally did."

She remarked how funny it was that he had waited so long to write, and the letter arrived after his death. We know that it is not uncommon for individuals who commit suicide to communicate with people they have not communicated with in some time.

Another female acquaintance provided a letter from Hartwig dated April 8, 1989, which stated in part, "I do not think the 1,200 men that went down on the U.S.S. *Arizona* were hiding," she had stated in the letter he should quit hiding in the U.S. Navy. He goes on to say, "or the 37 sailors that were killed on the U.S.S. *Stark* in the Persian Gulf in 1986! I could become one of those little white headstones in Arlington National Cemetery any day! Damn, I am sorry I went off on you like that, I guess I was venting my anger on you."

One of his sisters advised on May 10, 1989 that during the summer of 1988 he visited home and brought some explosives from his ship. During that visit he told the family that he was assigned to the safest place on the ship from attack from the outside. He stated, however, that if an accident occurred inside, no one would live to tell the story.

This same sister advised that after Hartwig's death, she went to his room and found in his typewriter a list of men permanently assigned to the gun turret. She believed he had typed that list while at home on leave in December 1988, and thought this was strange.

It was noted, by the way, that this was a list of the members permanently assigned to that gun turret. And he had left it in his typewriter at Christmas, his last visit home.

Another male acquaintance advised on May 28, 1989 that he and Hartwig had discussed death aboard ship.

The male friend stated, "We came to the conclusion that the quickest way we had ever seen anybody die, by explosion. He just said he imagined that he would not feel a thing and he would never know it. He said he kind of knew what I was going through because he had tried to commit suicide at one time.

"So we kept talking and talking, and when he confided in me that some—you know, he still thinks about it some time. The last couple of—you know, up until the last day he was fine, he was just quiet. He looked tired, he looked exhausted. He just looked like he was tired. He told me that he had problems, but he would not exactly state what his problems were."

Another instance, a chief petty officer discovered a piece of paper captioned "Disposable heroes" in the sleeping area occupied by Hartwig, Truitt, and others. The author and the date written are unknown, yet the contents make it worthy of note, because whether or not it was written by Hartwig, it is quite likely that he saw it.

"Sailor boy, made of clay, now an empty shell, finished here. Greetings, death, you coward, you servant, you patriot," underlined, "more death means another crew."

During home leave during Christmas 1988, he behaved much differently than he had before. He was reportedly much more relaxed and more outgoing than usual. Before he returned to his ship he left a note to his parents on the bed in which he told them how much he had loved them, an action that was described by his sister as being unique.

In another situation, he discussed the subject of suicide with yet another individual, who stated, "Hartwig appeared to have suicidal tendencies because he had discussed that the easiest method to kill himself would be an explosion."

By the way, the individual making that report also attempted suicide himself in the past.

Another one of his shipmates indicate that death was a frequently discussed topic by Hartwig. He had checked out a book, "A Glamorous Way to Die: The Kamikaze Mission of the Battleship Yamoto," and stated that the Yamoto was on a suicide mission that resulted in the death of more than 2,500 crewmen. That is from an interview conducted on June 10, 1989.

That is not the first indication of his fascination with ship disasters. Further documentation of this was revealed by the discovery of a photo album by NIS agents in Hartwig's room at his parents' home on June 7, 1989. That album contained nothing but newspaper clippings reporting on various ship disasters during the period 1979 to 1980.

Hartwig also told a shipmate he wanted to die in the line of duty and be buried in Arlington Cemetery. Those, sir, are our reasons for arriving at the idea of suicidal ideation.

Dr. AULT. Those are just a few of the reasons.

Mr. HAZELWOOD. There are more which we can go through.

Dr. AULT. To preface this just a bit, this report is composed of things that we pulled out that supported the overall opinion. These items do not in and of themselves comprise the whole package. There is more there in the interviews, in his writings and everything else. We could have gone on for quite a while.

Chairman NUNN. These are the highlights, though?

Dr. AULT. Yes, sir.

Mr. HAZELWOOD. You asked about why he had reason not to be aboard this ship when it left, I believe, Senator Nunn. Reason for damaging this ship, I'm sorry.

Chairman NUNN. I'd like to know the reason for damaging the ship. That was one of the conclusions.

Dr. AULT. He, according to one shipmate, had referred to the ship as a damned pig; disliked intensely his previous captain, apparently; had been the object of ridicule and rejection aboard that ship by many of his shipmates who knew him; and had at one time been the subject of a captain's mast.

One other interview subsequent to the time that we wrote this report with a shipmate indicated that he and his shipmate had a tremendously negative outlook toward the *Iowa*. Those would be a few of the reasons.

Chairman NUNN. Did you compare that to the other people on board the ship? Is there any young sailor on a ship that doesn't at some time or other say something derogatory about the ship?

Dr. AULT. Pardon?

Chairman NUNN. Did you compare it to anybody else?

Dr. AULT. If I may, one of the things that we're looking at here that has come up time and again in talking with your staffers is the fact that it is perfectly normal, having been a serviceman myself, to grouse about the particular unit that I'm established with. It's perfectly normal for some people to have a gun collection or a knife collection. It's perfectly normal to write some of the things that he wrote. All of those things are things that you see in other people.

What we are looking for in terms of the overall picture of somebody's disposition or predisposition towards a suicide or homicide is sort of a macro view of this individual's personality.

There are a lot of normal things in the world. The example that I used which I may modify for the purpose of this hearing is sort of like Ault's ship personality theory.

If you take a bridge—a bridge in the Navy is a fairly normal thing to see. There are bridges on your carriers and on your battleships and so forth. If you took a bridge and put it aboard a destroyer escort from the *Iowa* and mounted it on the destroyer escort—if one took a 16-inch gun off the *Iowa* and put it on the destroyer escort, they would both be normal weapons, but they would be totally out of place on that particular type of ship.

And so, when we look at the picture, what we are concentrating on, sir, is the bits and pieces. We are taking this as a whole. It is a gestalt, if you like, the whole picture.

Chairman NUNN. Let me ask one other question and I will defer to my colleagues.

How did you go about ruling out murder? I believe when the Navy first approached you, they had received evidence of the existence of an insurance policy on the life of Hartwig in which he had established another sailor as a beneficiary. I believe that was one of the reasons that the Navy came to see you, and they ruled out accidental causes. How did you go about ruling out murder?

Dr. AULT. At the time the motive given for the murder was obviously money. There may have been others. They were not speaking to one another. These two individuals were afraid of one another, and so forth.

It has been our experience, certainly, in certain types of individuals who are motivated, ideologically, or whatever, do not much care about their own lives as long as the objective is met, but that the individual in this case who was suspected of the homicide is not that type of person.

If he is the type of individual who is going to—as someone who is monetarily motivated, he is generally going to be more inclined to look out for his own safety. You know, why kill somebody for the money if you are going to go with them, and so partially on the basis—in fact, predominantly on the basis of the fact that it just does not fit with human nature, unless he were psychotic, and we do not have any evidence that this shipmate was psychotic. I do not think he killed Hartwig.

Mr. HAZELWOOD. Just to elaborate on it for a moment, that individual who was suspected of homicide was located, I believe, five stories below where the explosion took place in the powder magazine which would be, in my opinion, the most unimaginable place to be if you are going to set off an explosion above you. So we took that into consideration.

There are much simpler ways to kill aboard ship—throw the individual overboard. There are much safer ways than to set off an explosion while being in the powder magazine.

Chairman NUNN. Let me ask one other broad question without getting into the detail, but to get the background of this. When Admiral Milligan did his report, he based his most controversial opinions—namely that the explosion was the result of a wrongful intentional death and that Hartwig most probably committed that act—on several facts. He labels them facts—and I will not recite them all—one relates to turret personnel not taking emergency action such as activating the sprinkler system.

GMG2 Hartwig was the center gun gun captain, whose job was to control the ramming action, to insert a lead foil. The turret II equivalent was operating properly. All possible accidental causes ruled out. It goes on to list about seven different "facts." Then he lists as a part of that list the FBI's equivocal death analysis concluded that Clayton Hartwig died as a result of his own actions, "staging his death in such a fashion that he hoped it would appear to be an accident."

Do you believe it is proper to list your equivocal death analysis. which was your conclusion and your opinion, as you testified, as a fact?

Dr. AULT. Its existence is a fact. The opinion itself is just that, it is an opinion.

Mr. HAZELWOOD. We had no problem with his listing it as part of the reasoning, his reasoning process for arriving at his conclusion. We do not believe it was improperly utilized.

Chairman NUNN. Did you go back over and try to determine if the Navy was correct in ruling out accident?

Mr. HAZELWOOD. No, sir, we did not. We do not have expertise in that area.

Chairman NUNN. So that was strictly their assumption that you used?

Dr. AULT. Yes, sir.

Chairman NUNN. If they had not given you that assumption, if accident had been a possibility, how would you have changed your own analysis?

Mr. HAZELWOOD. Well, to begin with, sir, we would have referred this case to scientific personnel rather than ourselves as far as looking at it as an accidental explosion.

Chairman NUNN. In other words, if they had not ruled that accident, you would not have taken the case at all?

Mr. HAZELWOOD. No, sir, we did not say that. I said we would have referred the accidental nature of it to experts; that is, explosives experts, powder load experts, and we would have at least consulted with those individuals, yes, sir.

Dr. AULT. In the area of conjecture, if they had ruled that it were accident, in fact, obviously the forensic evidence would have had to support that and we would not have done anything. If they had not ruled out that it was not an accident in terms of procedure, we may well have looked at it to see if we could determine whether or not this individual was suicidal for them should they desire that question answered.

Remember, I had mentioned earlier, this is a problem-oriented process. We will still be happy to answer the questions they may have.

Chairman NUNN. What I am asking, is if they had not ruled out accident, could you have come to your conclusion?

Dr. AULT. If they had not ruled out it was an accident, but had not sustained that it was, in fact, an accident?

Chairman NUNN. If they had come to you and said we have got four possibilities—accident, murder, suicide, suicide-murder—if accident had been in that list instead of murder, suicide, suicide-murder, could you have come to a similar conclusion?

Dr. AULT. I would have, yes.

Mr. HAZELWOOD. Yes.

Dr. AULT. Looking at this gentleman in his entirety, I would have leaned in the direction of suicide had all four probabilities in some "best world" been equally probable.

Chairman NUNN. Senator Warner.

Senator WARNER. Thank you, Mr. Chairman. First a follow-up to my earlier questioning. I think it is incumbent on the committee to determine just exactly how the Navy treated this opinion and the extent to which they accorded weight to it in its ultimate finding, because I have read through the documents, as has the Chair and others, and it is not altogether clear.

This individual rose through the ranks and became a second class petty officer. That requires a certain amount of skill, knowledge, and leadership. It is not automatic. I have had some modest experience in gun turrets, and it takes a pretty tough individual to sit down in there, particularly a 16-inch gun turret when those guns fire.

I see your points. I carefully listened to your points, but what about the other side of the scale? You obviously weighed this individual as a human being. You have given us what I would characterize as those factors which largely are negative, that tilt the scales to reach your opinion.

What was on the other side? Again, he had been in the Navy sometime. He had achieved rank, was made a gun captain. It was not totally tilted one way. There must have been some facts on the other side. What were those facts showing—possibly that he was a normal sailor?

Dr. AULT. Sir, at one point I asked the investigating officers if they had any mitigating circumstances, interviews, anything at all that would show that this guy had been a happy camper.

Senator WARNER. What? Happy what?

Dr. AULT. Camper. Sorry, it is a slang term. We desired something to show that the facts about the individual which we had in front of us were somehow mitigated. They said no.

We did check a couple of things. For example, if you will examine the pictures in his room, you will see that he has a stack of Bibles there in his bookshelf. That is very important, obviously, to explore, and we explored it.

It would have been nice to report that once he was in the Navy that he had both faithfully attended services and that he was active in a church somewhere and so forth to offset some of this, but they could not even do that.

The subsequent investigation apparently showed that he just was not——

Mr. HAZELWOOD. He also wrote to Kendall Truitt that he was able to hide his hurt and his anguish inside. He was able to project another self to those about him.

Yesterday, I took the opportunity to go over 21 different interviews.

Senator WARNER. Twenty-one out of how many?

Of the bulk of evidence in this case, what percentage of it did you examine as it relates to Hartwig to reach your determination? Can you quantify that?

I am told there are hundreds of interviews. What percentage of them did you look through?

Dr. AULT. We could not quantify it, sir. Enough to know that we feel very confident in our opinion.

Senator WARNER. Well, there is no doubt that you are solid in your opinion. It is there, it is clear, it is all in writing. But I am just trying to establish what was on the other side of the scales because if it was so one-sided, I am concerned that the Navy did not spot this individual.

I mean, a gun turret team can become quite personal. The men who are in it get to know each other in a manner that is quite close.

Dr. AULT. The concepts of suicide, I think, are inexplicable. If we knew more about it, obviously, we would be better off.

Senator WARNER. In other words, you found in all this evidence really very little or an inconsequential amount to indicate he was a normal human being?

Dr. AULT. No, sir, I would not put it that way at all. We found very little evidence to indicate in favor of his not committing suicide.

Normalcy is not a term we would use here. A lot of the stuff that goes into his makeup is normal.

Suicide, like I said, is a funny thing. You do not know when somebody is going to do themselves in.

Senator WARNER. Let me just proceed again to this particular document dated June 16, 1989, entitled Hartwig, which was prepared presumably by you, although it does not have it on the thing.

Anyway, it says, "This analysis contains information of a confidential nature and it should not be disseminated except to individuals or agencies having a legitimate investigative and prosecutorial interest."

What is the restriction on the dissemination of this material or inclusion of it in our report? Have you worked that out with our staff?

Dr. AULT. We have. The problem is, it contains a great deal of third party information that we did not collect. The names and so forth in there from our agency's view should be protected.

Senator WARNER. Is there any material in here which led to your conclusion that ought to be eliminated from our public record?

Dr. AULT. I am not sure I understand the question.

Senator WARNER. You have reached an opinion. Are any of the facts on which you base your opinion to be eliminated from our record in order to protect other people?

Dr. AULT. Just the mention of third parties I think, sir.

Senator WARNER. What is the involvement of Truitt in this case? He is the beneficiary of life insurance. I find it very puzzling that Hartwig had family and sisters and that he left his policy to another individual.

Dr. AULT. I am sorry, sir, we precluded Truitt early in the analysis. The only question that arose with him was concerning the potential for homicide. We just ignored him after that.

Senator WARNER. What about Hartwig's giving an insurance policy to Truitt?

Dr. AULT. Personally I find it to be a little strange, but I understand that that was a common thing to do among shipmates back in the Navy during World War II.

Mr. HAZELWOOD. Hartwig also had written an earlier will leaving everything to another individual that he met at the military academy. That was a handwritten will.

He also gave a $200 monthly allotment to another individual. This, I think, is in keeping with his personality.

Senator WARNER. Does this then indicate he was somewhat alienated from his family, who would be the logical beneficiaries of his property?

Dr. AULT. I would say so.

If you are looking at a macro view, it shows several things. Again, a certain amount of immaturity. He forms these friendships and immediately goes overboard to solidify the friendships. He's not leaving his family a thing.

Senator WARNER. You mentioned an interview, I think, with one sister. There are two, are there not?

Dr. AULT. Yes, sir.

Senator WARNER. Did you talk to the other sister?

Mr. HAZELWOOD. We did not talk to anyone, sir.

Senator WARNER. Did you read the transcript of her interview?

Dr. AULT. I do not even know what her name is. I do not believe we did.

Senator WARNER. In other words, was there any difference of perspective among the family members' statements that you reviewed?

Dr. AULT. The family members, from the information that we gathered, the family members seemed to be fairly united in their opinions.

Senator WARNER. And what was their opinion?

Dr. AULT. Concerning Hartwig, sir?

Senator WARNER. Yes.

Dr. AULT. There were a lot of things. One, that he was a loner——

Senator WARNER. Well, do not repeat anything you have gone through. You have got it all in the record.

Dr. AULT. That his behavior was different, that he was a different fellow, I think, overall.

Senator WARNER. They are not experts, but did they indicate they felt he might have had suicidal tendencies?

Dr. AULT. We did not see any of that in there, no, sir. Not in the reports we received.

Senator WARNER. Did you wish to add something, Mr. Daniels?

Mr. DANIELS. No, sir.

Senator WARNER. Thank you, Mr. Chairman.

Chairman NUNN. Senator Dixon.

Senator DIXON. Dr. Ault and Mr. Hazelwood, my understanding of this is that the information that you had in the form of exhibits, statements and other things was given to you by the NIS, the naval investigative team. You did not develop those yourself?

Dr. AULT. No, sir.

Senator DIXON. The FBI did not gather this information. It was given to you by the naval investigative team, is that correct?

Dr. AULT. Yes, sir.

Senator DIXON. My second understanding is that you did not receive, as we have seen some of it, the raw interrogations of individuals with the questions and answers, that you were given a subjective analysis of that by the naval investigative team, is that correct?

Dr. AULT. No, sir. We received transcripts and heard tape recorded interviews in several cases.

Senator DIXON. In most cases did you receive subjective analysis?

Dr. AULT. In most cases, no. It was their report, our equivalent of what we call a 302, was ostensibly a related interview. I do not believe they analyze it in any respect. All they do is relate in written format the results of their interview.

Senator DIXON. I see. Now, I am told there were 267 exhibits which I hold in my hand. I am told that your analysis involved 25.

Dr. AULT. Twenty-five exhibits?

Senator DIXON. Twenty-five separate interviews.

Dr. AULT. There were probably more than 25, sir. There were some done a couple of times, and so on, plus photographs and others.

Mr. HAZELWOOD. Plus letters and writings of Hartwig.

Dr. AULT. There were other things that they brought down with them that we did not copy and that we just simply looked at and gave back to them.

Senator DIXON. But, in any event, what they gave you was what the Navy gave you. That is what you dealt with?

Dr. AULT. Yes, sir. We did not do our own investigation.

Senator DIXON. And it is clear, I think, that the Navy did not give you everything. My information is that there were at least 267 exhibits. You had nothing like that number that you dealt with.

Mr. HAZELWOOD. But, sir, the question I would respond with is how many of those exhibits dealt with the explosion itself rather than the behavior of the decedent.

Senator DIXON. I am not prepared to go into that yet, but I think I am correct in my statement about the circumstances.

Dr. AULT. At the time of the interview, though, we were assured that what we had was what they had in essence. They were doing interviews even as we conducted our session, but we had most of what they had.

Senator DIXON. And all of you have testified in support of the statement that I have in writing from the FBI. I asked after the first hearing that the Navy ask the FBI to determine whether the *Iowa* incident was an accident or not or did the Navy ask the FBI to determine whether Hartwig or Truitt was responsible. What exactly was the charge to the FBI?

The Navy answered that the FBI at the National Center for Analysis of Violent Crime, Quantico, was not asked to determine whether the *Iowa* incident was an accident—was not asked that.

The FBI was advised that no accidental cause for the accident had been discovered at the time the FBI assistance was requested.

The Naval Investigative Service did not ask the FBI to determine whether Hartwig or Truitt was responsible after the FBI was briefed on the investigation. They were asked to provide some insight into Hartwig's personality.

The FBI was asked to provide a profile of Hartwig and to determine if Hartwig was capable of committing such an act. That is the answer I received in writing from the FBI. Is that substantially responsive?

Mr. HAZELWOOD. Yes, sir, with the exception of the word profile. This is not a profile as we clarified it at the beginning. This is an evaluation.

Senator DIXON. Have you ever seen the poem "Disposable Heroes" that you referred to?

Mr. HAZELWOOD. Yes, sir.

Senator DIXON. Is it in your possession?

Dr. AULT. A copy of it is.

Senator DIXON. Is it in handwriting?

Dr. AULT. Part of it.

Senator DIXON. Have you analyzed the handwriting in your FBI analysis laboratory to determine who wrote the poem?

Dr. AULT. No, sir, we did not do any of the investigation at all. That would have been the Navy.

Senator DIXON. Has anybody?

Mr. **Hazelwood.** I believe, yes, sir. I believe that the NIS had their experts look at it and were unable to determine whether it was Hartwig's handwriting or not.

Senator **Dixon.** Well, surely the FBI could make that determination, you know, that there is evidence here that another person who was tragically killed in that tragic accident was known by everyone in the crew to be a fellow who assiduously worked at writing poems all the time, and it is the general view of the people in the crew that "Disposable Heroes" was not the handiwork of Hartwig at all, but another member of the crew.

Mr. **Hazelwood.** As we said in our reports here, whether or not he wrote it really had no bearing on the fact. The point was that he did have the potential of seeing it because it was posted in the area where he slept?

Senator **Dixon.** It was posted in an area where he slept?

Mr. **Hazelwood.** In the area where he, Truitt and the others slept.

Senator **Dixon.** How many slept there?

Mr. **Hazelwood.** I do not know, sir.

Senator **Dixon.** Well, how many who were killed slept there?

Mr. **Hazelwood.** I do not know that, sir.

Senator **Dixon.** Forty-seven were killed. Some slept there.

Mr. **Hazelwood.** I do not know how many, sir.

Dr. **Ault.** My understanding was that that particular sleeping area was where they bunked that watch or the majority of the folks there.

Senator **Dixon.** In the information that you received—you understand, I am not being critical of your analysis of what you got—did you receive information we have that, Mr. Hartwig on the occasion of the accident was not even assigned to that post?

Mr. **Hazelwood.** Yes, sir.

Senator **Dixon.** You have that?

Dr. **Ault.** We received that.

Senator **Dixon.** Do you have the information concerning his discussions that night prior to the occurrence with others about his plans for vacation, his hopes to go to London to enjoy recreational opportunities there and other things? You had that?

Mr. **Hazelwood.** Yes, sir. We heard that. We have never seen any reports on it.

Senator **Dixon.** And David Smith, who you mentioned, specifically, Mr. Hazelwood, in your expression of your opinion on the subject matter, you, of course, know that he has recanted substantial amounts of his testimony.

Mr. **Hazelwood.** It is my understanding he has recanted a portion of his testimony, yes.

Senator **Dixon.** Did you ever subject Mr. Smith to a polygraph?

Mr. **Hazelwood.** We did not conduct any investigation whatsoever, sir, no.

Senator **Dixon.** Now, it is a correct characterization of what transpired that the FBI for whom I have the firmest respect as a fine investigative agency actually itself talked to nobody?

Mr. **Hazelwood.** That is correct.

Senator **Dixon.** Interviewed nobody, analyzed no fingerprints, analyzed no writing, handwriting, otherwise did any investigation concerning the potential for volatility in that situation, an accident, an explosion, friction which can cause an explosion and has, we think, by the evidence and other occurrence in the past, a variety of things, none of that was done?

Mr. **Hazelwood**. We do not do that type of investigation in this type of request, sir.

Senator **Dixon**. You took, as you probably should, what the Navy investigative team gave you with the understanding at the time that all of this documentation was handed to you, that the Navy had excluded by its own careful evaluation and investigation the possibility of any accident of any kind, leaving you with three alternatives, murder, suicide, and I do not remember the other one right now, and analyzed on the basis of that?

Dr. **Ault**. They did not leave us with three alternatives here. We are not compelled by anybody's questions to answer just those questions.

Senator **Dixon**. But they asked those two questions?

Dr. **Ault**. They asked those two questions, yes.

Mr. **Hazelwood**. If we felt there was not sufficient information, we would have gone back and said there is not sufficient information to arrive at a conclusion of any one of the three.

Senator **Dixon**. Now, I am not sure who it was that said it, but I think, Mr. Hazelwood, it was you that suggested that the relationship, in the view of the Federal Bureau of Investigation, on the basis of the information they had from the naval investigative team, between Truitt and Hartwig had soured?

Mr. **Hazelwood**. Yes, sir.

Senator **Dixon**. For how long a period of time had that been the case?

Mr. **Hazelwood**. That was, what, 6 to 9 months, I believe. Ever since his marriage. Ever since Kendall Truitt's marriage.

Dr. **Ault**. Just before the first of the year of the accident.

Mr. **Hazelwood**. Yes, that is right. He got married in December of 1988, yes, sir.

Senator **Dixon**. So, for a year?

Mr. **Hazelwood**. No, sir. From about 4½ months.

Dr. **Ault**. December through April.

Senator **Dixon**. So a period of some months had transpired since the relationship had soured. I think to the extent that one of you indicated, perhaps you, Mr. Hazelwood, that the attitude was so hostile that their conversations consisted solely of what was done in the line of duty aboard the ship?

Mr. **Hazelwood**. That is what Hartwig wrote himself, yes, sir.

Senator **Dixon**. It had deteriorated to that extent?

Dr. **Ault**. Yes, sir.

Mr. **Hazelwood**. That is what Hartwig wrote, yes, sir.

Senator **Dixon**. Would you characterize that as a hostile situation that existed between the two?

Dr. **Ault**. There was more evidence to show that it was even more hostile than that, according to some of the other reports from other shipmates, but, yes, sir, that was hostile.

Senator **Dixon**. And Truitt was not present where Hartwig was in that gun turret?

Mr. **Hazelwood**. At the time of the explosion, no, sir.

Senator DIXON. Would it be a reasonable thing to presume in that situation that those in the immediate vicinity to Hartwig would be those injured or killed or otherwise injured in what transpired?

Now, is it not remarkable that a man who hated a man, who was hostile to him, would not cancel a cancelable insurance policy rewarding this enemy, and would contemplate suicide with the full knowledge that his suicide would benefit this person that he held this very hostile and adverse relationship with?

Dr. AULT. No, sir, I do not think so.

Mr. HAZELWOOD. I do not think it is remarkable.

Senator DIXON. It happens all the time?

Dr. AULT. No, I would not say that either. But I think that the concept of taking your own life is one that requires a great deal of understanding, in terms of the individual who is taking his life.

There are decisions that are made that, when the investigator arrives on the scene, looks absolutely silly. Why would a man jump off the bridge and leave his shoes sitting there? Why would a man shoot himself in the chest, yet remove his shirt first?

The contemplation of suicide is only part of the process. The part of the process that we are concerned with, that brought us to this point today, is the impulsive act itself. He has been rehearsing all his life for violence and death. Along the way somewhere he may have made his mind up that he was going to do it, our impression might be back in December when he was at home.

He may have gathered the wherewithal to do it, but never quite had the actual presence of mind to complete the act until this one morning when he is assigned unexpectedly to gun captain in that turret. So we do not find that things like that are necessarily weighted any heavier than a lot of the other material that we considered.

Senator DIXON. Is it your information that he was assigned unexpectedly that morning, without anticipating it, to the duty that he held that day?

Dr. AULT. We had understood that he had found out that morning that he was assigned to gun captain.

Senator DIXON. That on the prior night he did not know it was going to occur?

Dr. AULT. I do not know about that; I just had heard that he had——

Senator DIXON. Well, I believe that to be true.

Dr. AULT. I do not know, sir.

Senator DIXON. I must concede my time is up, but I would like one more question.

I have seen the documents you have used, and I recognize, of course, that this was what was given to you by the naval investigative team. We have all talked about forensic evidence here. I have been a State's attorney, assistant State's attorney, and I have been a defense counsel in criminal cases. I have heard that terminology a lot of times.

Other than these statements we have alluded to here, and these letters and other things, the poem, and things of that character, do you have any hard evidence, any evidence that would support the idea that Hartwig actually carried out this act?

Dr. AULT. No, sir. This opinion that we submitted is based on a half scientific, half art form.

Senator DIXON. On a kind of a profile of this whole deal?

Mr. HAZELWOOD. Based upon a lack of evidence to indicate one thing or another. In other words, there is no evidence to indicate homicide, suicide, accident. That is when we are brought in to render an opinion, when there is no evidence other than the behavior involved.

Senator DIXON. I thank you very much.

Chairman NUNN. Thank you, Senator Dixon. Senator Cohen.

Senator COHEN. Thank you, Mr. Chairman.

If it had been an obvious suicide, the insurance policy would have been canceled, is that correct?

Dr. AULT. I do not know.

Mr. HAZELWOOD. Under the terms of the contract, it is my understanding it would have been.

Senator COHEN. And so this individual, Mr. Hartwig, went to great lengths to mask a suicide so that the beneficiary of the $50,000 would collect it?

Dr. AULT. No, we never considered that.

Mr. HAZELWOOD. No.

Dr. AULT. We never considered that as any motivating factor in there. That insurance policy is a totally separate issue. We never considered that he would have been thinking about the insurance benefits to his friend there in the contemplation of the material.

Senator COHEN. A man takes out an insurance policy, understands the terms, makes a former friend, now enemy, the beneficiary, and yet that plays no part in the way in which he goes about killing himself?

Dr. AULT. We just do not believe—again, this is our opinion, we just do not believe that thoughts of insurance and beneficiaries played any part in the major process of his decision to kill himself.

Senator COHEN. Do you think that people who kill themselves have any thoughts about whether or not their policy is going to be canceled or not?

Dr. AULT. They have all kinds of strange thoughts.

Senator COHEN. Do they have concerns about whether or not the policy will be canceled and the beneficiary will receive——

Dr. AULT. Some go to great extremes to make a suicide look like an accident or a homicide just for that reason.

Senator COHEN. Precisely for the reason they want the insurance policy to go——

Dr. AULT. But in this particular case, that had nothing to do with the process, in our opinion.

Mr. HAZELWOOD. In our opinion.

Senator COHEN. Okay, we will look at that.

At the time the Navy came to you, had the Navy reached a preliminary decision that Hartwig was responsible?

Dr. AULT. No, I do not believe so.

Mr. HAZELWOOD. No, I do not think so.

Senator COHEN. They just came to you and said, look, we do not think it was an accident?

Dr. AULT. We do not think it was an accident, and their concern was—because apparently this was close to the time when the letter had surfaced to the Navy concerning the insurance, they wanted to know about the possibility for it.

I think their initial concern was homicide on the part of his shipmate.

Senator COHEN. Okay. The point that I am getting at is the Navy said, we do not think it was an accident, period?

Dr. AULT. Yes, sir.

Senator COHEN. We do not know who did it, right?

Dr. AULT. No.

Senator COHEN. Did they indicate to you that they had a predisposition that Mr. Hartwig had in fact——

Dr. AULT. Yes. Yes, in fact, they did.

Senator COHEN. Well, that is what I am asking.

Dr. AULT. What they said to us was that there was something that happened very quickly; the forensic evidence shows that something happened very rapidly in that turret and in that particular gun room. And that the only one in position at that point to make those things happen was Clayton Hartwig. Would we take a look at him.

Senator COHEN. Did they indicate to you that they had a preliminary disposition to Mr. Hartwig having committed the act?

Dr. AULT. They did not say it that way, no.

Mr. HAZELWOOD. They were also concerned about the possibility——

Senator COHEN. Well, they did not say it that way, is that not the way you pursued it?

Dr. AULT. No, that is not the way we perceived it.

Mr. HAZELWOOD. They were also concerned over the possibility that it may have been a homicide on the part of Kendall Truitt.

Senator COHEN. Did you have access to the records of all the others who were in the turret?

Mr. HAZELWOOD. No, sir.

Dr. AULT. No, sir. We did not even ask for them.

Senator COHEN. You did not request them?

Mr. HAZELWOOD. No, sir.

Senator COHEN. Why not?

Dr. AULT. Because—I just told you, something happened very quickly. The forensic evidence showed the only person in position to make that something happen quickly—this is what the Navy told us——

Senator COHEN. Would you stop for a moment. I asked you initially the question of what happens, at what point in the process do you come in to the scene. After the normal investigative process has been exhausted and there is a question mark, and they want to call upon your expertise?

You indicated at that point that you could confirm certain facts or conclusions; you could modify them, reject them, tell them they are going in a completely wrong direction, right?

Dr. AULT. That is right.

Senator COHEN. In this particular case, you did not review the statement that they thought it was not an accident, you assumed that?

Dr. AULT. No, no. We were told that.

Senator COHEN. And you accepted that?

Dr. AULT. We accepted it.

Mr. HAZELWOOD. Yes, sir.

Senator COHEN. Okay. So you accepted their proposition that it was not an accident?

Dr. AULT. Right.

Senator COHEN. We think that it must have been a deliberate act?

Mr. HAZELWOOD. On the part of someone.

Dr. AULT. On the part of someone.

Senator COHEN. On the part of someone.

And then they say we have this one unusual situation here, pointing to an insurance policy, was that it?

Mr. HAZELWOOD. What we have is a relationship between two individuals that has obviously soured, we think it is either a possibility of a homicide on the part of——

Senator COHEN. Who said we think, the Navy?

Mr. HAZELWOOD. The Navy.

Dr. AULT. The Navy thought that.

Mr. HAZELWOOD. We think it is either a homicide on the part of Kendall Truitt or it is a possibility of a suicide-homicide, or a suicide on the part of Hartwig. We would like for you to look at the materials we have available.

Senator COHEN. In your judgment, if there were other individuals who were inside the gun turret, as professionals, would it not have been of interest to you to make an assessment as to whether or not there were other individuals who had different types of personality profiles?

Mr. HAZELWOOD. No, sir.

Dr. AULT. No.

Mr. HAZELWOOD. Whenever we are required or requested to do a case for an investigative agency, we make the assumption we are dealing with a professional investigative agency. They provide us with materials for review. That is what we review.

Senator COHEN. On the issue of the poem, "Disposable Heroes," is there, in your experience, a feeling among the men in the Navy that they might feel like disposable heroes?

Dr. AULT. I imagine that is not just confined to the Navy.

Senator COHEN. Anyone wearing a uniform who might be in the way of harm?

Dr. AULT. Yes, sir.

Senator COHEN. In other words, if someone is out on a ship and they read about the U.S.S. *Stark*, and say, hey, that could happen to me?

Dr. AULT. That is right.

Mr. HAZELWOOD. This is right. Yes, sir.

Senator COHEN. And so it is not unusual at all to have people in our military services have a sense of either impending danger or death?

Dr. AULT. Certainly not, sir.

Senator COHEN. As a matter of fact, that is a fairly strong bonding feeling that develops with one or two close friends, exposure to danger, is it not?

Dr. AULT. You are absolutely right. Sure.

Senator COHEN. Now, if someone else writes a poem and they post it on a bulletin board or in an area where others sleep can you use that as an incriminating or damaging piece of information?

Dr. AULT. No, sir. We use that as one of a large body of information, starting with his high school days and moving all the way forward to the time of the explosion. And certainly we threw that in because you never know what the triggering incident is going to be in a case like this. You never know whether or not just reading that poem and saying, that is it, you know, that might have been the thing that sparked some decisions on his part. We included it for that reason, not as a single indictment.

Senator COHEN. Maybe he never even saw it?

Dr. AULT. That could be. That is what we state in our report.

Senator COHEN. You indicated that he had a stack of Bibles on his bookshelf?

Dr. AULT. Apparently his mother had made his room up, and one shelf had seven or eight Bibles on it.

Senator COHEN. What relevance is that?

Dr. AULT. None now. At the time, the fact that those existed or were there along with all the other books that he had concerning violence and war and ships and explosives and his Soldier of Fortune things and everything, it was very important to explore a potentially mitigating circumstance, the fact that he——

Senator COHEN. What does the relevance of having seven Bibles on one shelf have to do with suicide?

Dr. AULT. It has nothing to do with suicide. It has something to do with the other side of the coin. If, in fact, the individual was a strong practitioner of a certain faith, then I would want to know that to make my opinion. In this case he was not, so we precluded it.

Senator COHEN. I do not understand what you are saying.

Dr. AULT. I am not sure we are communicating. Let me try again.

When we look at an individual——

Senator COHEN. Dr. Ault, let me put it this way. I have seven or eight Bibles sitting on my shelf up in my office.

Dr. AULT. Yes, sir.

Senator COHEN. Of what relevance is that to my particular personality?

Dr. AULT. Well, I am not sure. I have not seen the rest of your books or what you do in private or anything else, so I cannot begin to tell you, sir.

Chairman NUNN. The rest of them he wrote himself. [Laughter.]

Senator COHEN. Mr. Chairman, that is very gracious. I have about 1,500 books in my office, and they are not all by me.

Dr. AULT. Let me try to put it in a context for you. In his room, when we looked at the pictures of his room, there were all kinds of books on violence, a lot of books that dealt with violence, dealt with the Navy. Again, in the course of normal things that would be fine. Those would be nice aspirations.

This individual's whole life, however, revolves around the aura of violence and death. Everything he does from the reading of Soldier of Fortune magazines to his war games that he played in——

Senator **Cohen**. If someone reads Soldier of Fortune magazines, that indicates that they are predisposed toward death?

Dr. **Ault**. Well, what else is the purpose?

Mr. **Hazelwood**. You are taking one item.

Senator **Cohen**. I am going to go through one by one to see exactly the rationale used. The fact that someone has seven Bibles on his bookshelf and does not go to church services means nothing to me.

Dr. **Ault**. It does to me. I am the individual who gave this opinion.

Senator **Cohen**. Well, tell me what it means to you, then. I want to hear this.

Dr. **Ault**. I am trying to.

Senator **Cohen**. Well, I am trying to listen.

Dr. **Ault**. What I was saying was that this man's whole record that we had in front of us reflects a preoccupation with death and violence. He made bombs. He blew them up. He read Soldier of Fortune magazines. He collected knives that were oriented toward killing people. He carried a 9 millimeter with him. Everything in his makeup shows that he is oriented toward death.

When we go through the room and we look at the collection of his books to see kind of what he read and what he thought, we see books on death and violence, and we see Bibles. Now if he had gone from that room into a seminary——

Senator **Cohen**. How much death and violence do you find in the Bible?

Dr. **Ault**. Sir, I am not here to argue that with you. I am neither a theologian nor am I really prepared to respond to the question. If you want to include that, fine.

What I am saying is if you went to a seminary from that point on, then I would be inclined to rule or to form an opinion that something less than suicide was a potential for this guy; but he did not. He went from that room into the Navy, worked as a gunman. He continued with this process of death and violence, this fascination which some people may think of as normal, until he reached the point where an explosion occurred in the turret where he was in charge.

Senator **Cohen**. Is it abnormal for members of the Navy to have subscriptions to Soldier of Fortune magazine?

Dr. **Ault**. I do not know.

Senator **Cohen**. Would it be a relevant factor?

Mr. **Hazelwood**. It depends on what we are looking at them for. Yes, sir, it may or may not be relevant.

Dr. **Ault**. I recall very few of my fellow marines who subscribed to Soldier of Fortune magazine.

Senator **Cohen**. Very few of your fellow marines were given to violence?

Dr. **Ault**. That is the limit of it.

Senator **Cohen**. Do they not teach you a lot of violence in Marine boot camp?

Dr. **Ault**. They teach us to hate the enemy.

Senator **Cohen**. Carry knives, use them?

Dr. **Ault**. Absolutely, and to talk about survival rate.

Senator COHEN. Let me go back, if I may have a bit more time, Mr. Chairman.

He was a loner. Is that one of the significant factors, someone who likes to keep to himself?

Dr. AULT. Yes, sir. Not only a loner but unable to communicate with people, bottling up his own feelings, incapable of communicating with others.

Senator COHEN. How many people do you think there are like that in society who tend to be shy, introspective, and not able to articulate their feelings openly?

Dr. AULT. If I could answer your question, if I go back to the idea that what you are talking about item by item are relatively normal things. We have a lot of this. In Montreal last week we had somebody who had those same normal characteristics kill 14 women. It was a terrible tragedy.

We are punctuated with those kinds of incidents where people who seem to be loners and so forth suddenly act out in that way.

What I said earlier was that we have a lot of normal things that look normal in a personality that goes out and acts normally. If you take something as normal, for example, in my example as the bridge on the *Forrestal* and you place it on a destroyer, then the whole thing is no longer normal. It looks lopsided, and that is what we are talking about here.

Senator COHEN. I do not find that analogy relevant here in terms of placing a bridge on a destroyer. What I want to do is go through and analyze.

You indicated, for example, he sent letters to women. He had three close women friends?

Dr. AULT. Only three close women friends.

Senator COHEN. Is that unusual? I do not think I have three close women friends. What is unusual about that? You have a man in the Navy, which is exclusively male oriented out on the ships, no ladies out there. He has a close relationship with one good friend, maybe one or two others. They have arguments from time to time. He may have a grudge against this one individual. He has three close women friends, and that is unusual?

Dr. AULT. With whom he had never had any sexual contact as far as we have been able to determine.

Mr. HAZELWOOD. By whom he felt betrayed, also.

Dr. AULT. By whom he felt betrayed. One woman he proposed to on his second date. She turned him down.

Senator COHEN. At what age?

Dr. AULT. Twenty-three.

Senator COHEN. Where had he been? Out on the ship for 6 months?

Dr. AULT. We are talking about the relationship with three women friends.

Senator COHEN. What is unusual about that? What were the circumstances in which he proposed to one woman?

Dr. AULT. He probably just picked her up from the bar, I am sure. I do not know.

Senator COHEN. You do not know the details of it?

Dr. AULT. I do not have the details.

Mr. HAZELWOOD. She was a dancer in a strip joint.

Senator **Cohen**. Is it unusual for sailors to propose to women dancers in strip joints?

Mr. **Hazelwood**. On second dates, I would think so, sir.

Senator **Cohen**. Is it unusual on the first date?

Mr. **Hazelwood**. I would think so, sir.

Senator **Cohen**. But there are some sailors who go out after having been out at sea for considerable lengths of time, who end up seeing someone who is attractive, who might be a stripper in a strip joint and make a proposal, maybe under the influence, maybe just suffering from lack of companionship?

Mr. **Hazelwood**. That is quite possible. As far as that girl, when he corresponded with her she advised him that she was now engaged to another person.

One of his other close female friends was the one that had sex with his friend at the academy.

Senator **Cohen**. Is that one of the close friends that you listed?

Mr. **Hazelwood**. Yes, sir. These are the three.

Senator **Cohen**. Who was the second one?

Mr. **Hazelwood**. Another one that he was a close friend with he claimed had had sex with his friend he had been sending $200 a month to. When he found that out, he ceased the allotment and in fact wrote that same girl and accused her of letting him down, and the world about him was changing.

Senator **Cohen**. Would you find that an extraordinary reaction?

Mr. **Hazelwood**. Would I find it an extraordinary reaction sir? I would find it a very unusual reaction.

Senator **Cohen**. He finds out a friend is having relations with someone that he thinks is a friend of his, that he has some attachment to——

Mr. **Hazelwood**. And ceases a $200 a month allotment? Yes, sir, that is kind of——

Dr. **Ault**. I would find the initiation of the allotment and everything else unusual, but the ceasing of it for those reasons is also unusual.

Senator **Cohen**. I am not sure I understand this. He is having at least an emotional relationship with a given individual?

Dr. **Ault**. Apparently a male individual.

Mr. **Hazelwood**. I do not think it is an emotional relationship with a female. I think it is a correspondence relationship with a female.

Senator **Cohen**. That is the other one he was close to?

Mr. **Hazelwood**. Yes, the one that had sexual relations that caused him to break off the $200 monthly allotment to the male friend, yes, sir.

Senator **Cohen**. What you are saying by implication is that he had at least either an overt or latent homosexual relationship with him?

Mr. **Hazelwood**. No, sir, I did not state that.

Senator **Cohen**. You are not saying that?

Mr. **Hazelwood**. No, sir, I am not.

Senator **Cohen**. Let me get down now to the other characterizations. He carried grudges against those who he felt had wronged him?

Mr. **Hazelwood**. As reported by his sister, yes, sir.

Senator **Cohen**. Is that unusual?

Dr. **Ault**. It depends on the extent of the grudge.

Senator **Cohen**. Or what happens with the grudge. In this case, what kind of grudges did he bear?

Mr. **Hazelwood**. As a matter of fact, his sister stated he carried grudges for long periods of time. She felt it was unusual enough to mention it to the NIS investigators.

Senator **Cohen**. So if you carry long grudges, that is one of the factors you take into account?

Mr. **Hazelwood**. His sister certainly thought that was unusual, yes, sir.

Senator **Cohen**. His grudge was not so long in this particular case against his friend that he wanted to cancel an insurance policy?

Mr. **Hazelwood**. Four and a half months.

Dr. **Ault**. The grudge was 4½ months, and they were threatening to kill one another, and they did not speak to one another during that time, which seems a little excessive.

Senator **Cohen**. So he carried the grudge right to the very end then?

Dr. **Ault**. I would say so.

Senator **Cohen**. But not stopping to cancel the insurance policy that is going to benefit the friend.

Dr. **Ault**. It is a strange thing.

Senator **Cohen**. You drew some significance from the fact that he signed one of the letters "Clayton" rather than "Clay"?

Dr. **Ault**. I think he said "love always and forever".

Mr. **Hazelwood**. "Love always and forever, Clayton", and the recipient of that letter found that to be very unusual.

Senator **Cohen**. Excuse me. You indicated that you drew a distinction between Clayton versus Clay.

Mr. **Hazelwood**. The recipient did.

Senator **Cohen**. What is the distinction?

Mr. **Hazelwood**. "Love always and forever, Clayton", much more formal than simply "Clay", as he had signed his letters in the past. With "forever", no "love", nothing, just "Clay". He had signed his letters, he had signed his letters in the past.

Senator **Cohen**. Another factor I think you drew that was negative was that he said he could hide his hurt inside and never reveal it?

Mr. **Hazelwood**. That is what he said, yes, sir.

Senator **Cohen**. Is that unusual?

Mr. **Hazelwood**. When you combine that with the fact that people reported never seeing him angry, never seeing him violent, that, to us, is a danger sign to us, that people do not ventilate their hostility or their anger. We have seen too many occasions where they have just stored it up and stored it up and stored it up and then went out and murdered 14 people in a college or then blew up a ship or then killed people in a shopping center, yes, sir.

Senator **Cohen**. By contrast, you have also seen individuals who explored emotionally venting their anger, and then you use that as evidence that he had an irrational reaction to a situation?

Mr. **Hazelwood**. Not necessarily. It depends on the situation.

Dr. **Ault**. It depends on the situation.

Senator **Cohen**. I find that there is an awful lot of reaching here in terms of saying someone hides the hurt inside. I mean, one of the things that we train ourselves as professionals, as you do and we do as lawyers, is do not get emotional, do not overreact, do not vent your anger. Anger blows out the lamp of the mind. Be cool. Keep it inside.

Mr. **Hazelwood**. How many of us are successful at that, sir?

Senator **Cohen**. There are a few of them sitting right here that are pretty successful at it.

To quote another poet, we all prepare our face to meet the faces that we meet. Most people in this life wear masks. Every one of us in this life wears a mask of one dimension or another.

There is an article in one of today's papers that indicates that you found a photograph showing Hartwig dressed as a Naval commander somewhat negative, the implications being negative. Would you explain that?

Dr. **Ault**. That is what the newspaper said.

Mr. **Hazelwood**. That is what the newspaper said we said, sir.

Dr. **Ault**. I would like to know where they got it from.

Senator **Cohen**. I know nothing about the photograph. Why not just tell me what it was?

Mr. **Hazelwood**. This is from the Washington Times, December 11, 1989. "Hartwig's profile based on two photos." That is basically it, a picture of him as a young boy wearing military insignia.

Senator **Cohen**. You never saw this?

Mr. **Hazelwood**. I have never seen this picture before.

Dr. **Ault**. We never saw the photographs.

Senator **Cohen**. It never played any role in your analysis?

Dr. **Ault**. No, sir.

Senator **Cohen**. Mr. Chairman, my time is up so I will defer for the time being.

Senator **Warner** [presiding]. Gentlemen, I am going to ask one question. I have tried as best I can to be absolutely fair and to allow all the evidence to come out from all the witnesses thus far, and I would like to make this statement. If anybody has some evidence which can help solve this mysterious case, please come forward and let the Chairman and myself know. That is the bottom line, and that includes the family.

I am quite taken with some of the evidence that the family had provided. As a matter of fact, I have asked whether or not there are some positive things, and you all have indicated that there is very little, that it is more negative. I think, you know, the Navy is on trial here in a certain way, and I think it is about time we brought out just how rough some of these statements are and how tough and presumably accurate these statements are that the family made about this young man.

Am I correct that they were rough and tough?

Mr. **Hazelwood**. Yes, sir.

Senator **Warner**. Would you mind articulating a few? I have asked for both the good and the bad. Let us get it out.

Dr. **Ault**. Are you talking, sir, about the statements that the family related to the NIS agents?

Senator **Warner**. That is right.

Dr. **Ault**. I am not sure it is our place to do that, sir. That is the NIS investigation.

Senator **Warner**. We will have to make an assessment on how to get this information out, because it appears that maybe somebody is holding something back.

Dr. **Ault**. I would be happy to answer it. It was not our investigation to begin with.

Senator **Warner**. We will deal with it maybe in another manner, but I am not going to sit by and let the Navy take it in the teeth in this case when there is evidence in here which in my judgment could bear on the conclusions and findings.

Mr. **Brusnahan** [from the audience]. Senator, I hate to interrupt. I am here on behalf of the family. I am their attorney. If there is any family member that you would personally like to talk to or question today, we are here, and we would be delighted to answer your questions.

Senator **Warner**. Make that known in writing to the chairman, and I thank you.

Senator **Cohen**. A couple more questions, Mr. Ault and Mr. Hazelwood. I am being a skeptic here, just trying to put you to a test to satisfy myself.

One of the negative factors that you mentioned was that he had achieved his goal to be a petty officer. Does that mean, therefore, since he is lacking in higher aspiration that that was another factor that goes into this overlay on the mind of the individual?

Mr. **Hazelwood**. It is another factor, yes, sir.

Senator **Cohen**. In a letter, Mr. Hartwig said, "I could become one of those headstones any day?"

Dr. **Ault**. Yes, sir.

Senator **Cohen**. Why is that so unusual?

Mr. **Hazelwood**. I think what was unusual, sir, not only with that statement but the fact that he also discussed it with another person—that is the letter that he wrote to which you are referring to, but it was in response to the point that the young lady that was corresponding with him had asked him why he was hiding in the Navy, and it was an overreaction on his part. I am not hiding in the Navy, and he goes on to describe one ship disaster and, of course, the disaster in Lebanon with the Marines, and then going on saying that he could become a headstone in Arlington Cemetery.

Combine that with the statement that he made to a shipmate of his where he would like to be killed on duty and be buried at Arlington, then the statement becomes significant, yes, sir.

Senator **Cohen**. I must tell you, I find it hard to arrive at that judgment. You take a young man. He is out on sea duty. He is writing to a woman who says he is hiding out, whether emotionally or physically hiding out. He writes back and says, hey, wait a minute, I am not hiding from anyone, I am out here working with X thousands of people in a very dangerous environment, and I could become like any one of those hundreds of other headstones that occurred in Beirut or the U.S.S. *Stark*.

Then he makes a statement to a friend and says if I go I want to go in the line of duty. Is that unusual for a soldier or sailor to make a statement, if I am going to be taken out I want to do it in the line of duty and end up in Arlington?

Mr. HAZELWOOD. I was in the Army 11 years, and never once did I or any of my friends make a statement that I would like to die in the line of duty. No, sir. I did not want to die in the line of duty.

Dr. AULT. I do not believe any of us are trained to die in the line of duty particularly.

Senator COHEN. Given a choice of this individual saying if I am going to die I want to do it in the service, let me put it this way, service of my country. Is that different?

Mr. HAZELWOOD. He did not say that, sir.

Senator COHEN. What does "line of duty" mean if it does not mean service to the country?

Mr. HAZELWOOD. He did not say that. He said "I want to die in the line of duty."

Dr. AULT. The point that we look at is, again, the whole fabric of his personality is death and destruction. His hobbies seem to revolve around that. His writings revolve around it. His makeup seems to be oriented toward it.

Senator COHEN. I was in a helicopter down in El Salvador. I was on one of these fact-finding missions, and I was in a helicopter. We experienced some malfunction of the chopper at 10,000 feet over San Salvador. We were in danger of going down, and I yelled over to my Marine escort imagine this, here I am all the way down in El Salvador, and I am going down without a shot having been fired in anger.

Mr. HAZELWOOD. But you did not say "I would like to go down."

Senator COHEN. Was the implication not that if I am going down, better to go down due to an act directed toward the United States as opposed to a simple piece of equipment malfunctioning on a helicopter? Do you draw something from that?

Dr. AULT. I would if you had been in your office, if you had said that in your office.

Senator COHEN. But his office is out on the sea. He is out in the line of fire.

Dr. AULT. But from the 10th or 11th grade on we have seen his kind of ideation and his kind of thinking process all the way through. He has moved into a form of employment that certainly reinforces everything that he sought all his life. It would be a natural thing, and he has moved all the way up to the point of the explosion in that process. We have a broad picture of a young fellow whose whole orientation is death and violence.

Senator COHEN. The Bible figures in that?

Dr. AULT. The Bible figures it out. If he had gone out of that room and put behind all the violence, gone into a seminary, it would have been a different orientation entirely, a different conclusion.

Senator COHEN. But because he had seven Bibles and did not go to church services, that was another indication that he was given to death and destruction?

Dr. AULT. That would be a very small part of my reasoning, yes, sir.

Mr. DANIELS. Senator, if I might, let me qualify it by saying I am not the expert here, nor do I pretend to be, but it would appear to me that each one of these forms of behavior that you cite and ask the question is this highly abnormal, I would dare to say that it may be inherent in people in this room.

From what I have been able to gather from my review of this matter, however, is there is a preponderance of behavior, not one or two incidents, that has led these two gentlemen to their conclusion, and I would submit to you it is a preponderance of behavior, not each individual one.

You ask the question, is this unusual, is this——

Senator COHEN. Mr. Daniels, what I am suggesting is that they are given a very narrow framework within which to work. They come to Mr. Ault and Mr. Hazelwood and say that they have reached a decision preliminarily that this was not due to an accident.

Mr. DANIELS. We could have very easily gone back, Senator, and said we have no behavior——

Senator COHEN. Let me finish. They come and say we are of the opinion that this was no accident. Mr. Ault and Mr. Hazelwood correctly said that they do not have the expertise to challenge that. We accept that.

They also give you a situation which indicates or at least points in the direction of a specific one or two individuals, and they say, now, tell us what you think. You go back and you construct a profile, picking up these individual pieces, not one of which we all agree would be particularly damaging. I think you would find many of these characteristics in a good cross-section of the American people.

When you put them all together, however, you say given the fact that the Navy does not think this happened accidentally and given the fact that we have excluded the friend who was not there, we now have this one individual, we look at his personality profile, and we conclude that the probability is that he committed an act of suicide.

I am saying what if you had the personality profiles of a dozen other people, the number who were in the gun turret itself? There was evidence that you could have reviewed, not that you requested it. You were given a very narrow job to do in this particular case.

I am simply suggesting that there may have been other individuals inside that turret. You are shaking your head, Mr. Ault. There may have been other individuals inside the turret who had precisely but quite consistently the same kinds of personality traits as this individual.

Maybe we have some statistics on this, but if you went down, for example, and took a look at the personality traits of the individuals who volunteer, let us say, for the Navy or the Marine Corps or the Air Force, I suppose you could go down through and take a pretty healthy cross-section and find a number of loners who look to go into the military for a variety of reasons.

You would probably find that during their childhood they have played with toys and pistols and collected them. You may even find that they were members of the Boy Scouts or the Pathfinders.

You may have found a series of traits leading individuals who want to go into the military, which if you look in a post factor, take a review looking backward, say wait a minute, gee, this guy was quiet, he was shy, he did not get along with women very well, only had three close women friends, did not handle the sexual aspect particularly well, talked a lot about death, though he might become a victim out on the open seas. I think you would probably find a pretty broad cross-section to which that could apply.

Dr. AULT. Sir, the whole turret may have been full of suicidal people. The evidence that we accepted from the Navy that there was no accident was also the same kind of evidence on which they stated that the only guy in a position to do any damage was Clayton Hartwig. That is why we looked at Hartwig only.

The forensic evidence, which we do not reject, states that Hartwig was the only person in position to do the kind of damage that happened. It is as simple as that.

Senator COHEN. You had no basis to challenge that?

Dr. AULT. No, sir. We assume that they are a professional organization.

Senator COHEN. What conclusion did you draw of the fact that he was collecting statistics on, or information on battleship disasters in the year 1979 to 1980?

Dr. AULT. Just again, it is sort of a thread in the whole personality.

Senator COHEN. Was that before he went into the Navy?

Dr. AULT. I presume it was.

Mr. HAZELWOOD. He was 24 when he died. He would have been about 16—15 or 16.

Dr. AULT. That, combined with the book that he checked out on the *Yamamoto* disaster, combined with——

Senator COHEN. If he were planning a career in the Navy, do you think it is unusual that he might be concerned about how many disasters there are at sea?

Dr. AULT. In this case, I would think it was unusual. I would try not to think about that.

Senator COHEN. Do you think he was planning, as early as 1979, 1980, to engage in a battleship disaster at that point?

Mr. HAZELWOOD. No, sir. I think he was fascinated by violence as early as 15 and 16. If he had been planning on entering the Navy at that time, which he may very well have been, I would have found it not at all unusual if he collected articles on ships, period. But just ship disasters, that is all he had in that three-ring binder. Nothing on U.S.S. *Kennedy* coming home, nothing on the launching of a ship, nothing on the battles of a ship. Simply, disasters of ships. That is all he had in that three-ring binder—articles on disasters of ships.

Senator COHEN. Do you interpret that as being potentially suicidal?

Mr. HAZELWOOD. I interpret that as being fascinated by violence.

Dr. AULT. In a broad background of experience in violence in general, we find people who are predisposed to a certain kind of violence often collect material on that kind of violence. Some murderers collect information on pornography, for example—I do not want to surface that issue separately, but will collect certain types of reading material that orients toward the violence the way they commit it. So we built that into the picture.

Senator Cohen. I think we better go back and do a survey of our military personnel to find out what the traits are of all those going into the military, whether they have ever collected information on violence or played with handguns, or collected guns.

Dr. Ault. It would seem to fit that if I had a predisposition toward violence I would drift into the kind of work that would best exercise that predisposition. If I were a klismaphiliac and loved to give enemas, I would want to work in a hospital where enemas could best be delivered.

The same is true with violence. If I am predisposed toward violence, and that is the way that I think and that is the stuff I like to do and I like to make bombs, then I would probably wind up in that kind of employment.

Senator Cohen. Those are the only questions I have for now, Mr. Chairman.

Senator Warner. Just speaking for myself here, I am still concerned about the process we are following in this hearing.

We are doing the best we can to assess certain aspects of this case which are available for public scrutiny and public assessment; yet, there are other aspects to this case which while it may not have been important in some of your assessment, or the Admiral's assessment, in this Senator's assessment I think they are germane, and somehow we are going to have to get at the bottom of them; but in the absence of the chairman I am not able to do that.

Senator Cohen. Could I ask one other question that intrigued me? You also indicated his letters show he was extremely egocentric, or there is an egocentricity to be found in his letters. What do you mean by that? Give me some examples.

Dr. Ault. Self-absorbed, narcissistic.

Senator Cohen. Those are words. Tell me what reveals that he was self-absorbed and narcissistic.

Dr. Ault. In the extent of the letters here, we see that his worry was about himself, that while he was outwardly very generous in some cases there, concerning those situations where he himself would benefit we have posited from the letters that we read there that he was in fact a very self-centered guy, narcissistic. It adds again to the weight.

Senator Cohen. Rather than characterizing it, can you give us an example of what you would call being narcissistic?

Dr. Ault. The letter where he describes, "am I really good looking," and so forth, confirmation that way. My bumper sticker theory of personality holds that the kind of a person who would be narcissistic would be the one who says "if you do not like the way I drive, stay off the sidewalk." The person who is capable of slapping you in the face and then not really understanding why you are angry.

Senator Cohen. You are giving me bridge metaphors again. Give me an example of what he says in the letters. I have not read the letters.

Dr. Ault. The fact that he says, "so your friends think that I am good looking, huh?" in one case. In another, he writes——

Senator Cohen. You have got to be kidding me. You are telling me, because he is writing a letter to a friend and says "you think I am good looking"——

Mr. HAZELWOOD. We are not kidding you, sir. We are trying to answer your questions.

Senator COHEN. This is a 24-year-old, relatively immature individual, who says "so your friends think I am good looking," and that is egocentricity? Here is a man looking for compliments. Is that unusual in a 24-year-old sailor?

Mr. HAZELWOOD. That is one example, sir. Fishing for compliments, not just looking for compliments. Fishing for compliments.

Senator COHEN. Most of the U.S. Senate would stand indicted for that.

Mr. HAZELWOOD. I have no comment on that, sir.

Senator COHEN. I am looking for an answer, Mr. Chairman. If that is one of the factors involved with egocentricity——

Dr. AULT. Sir, that is one of the many factors involved. Okay: the exaggerated status of his life, the bragging that he was going to be assigned as a VIP bodyguard in a special SEAL unit when in fact he was not, those kinds of things, are indicative of the kind of an individual who is ego-oriented.

Let me see if I can find some other stuff here, too. The letters that he wrote, his constant threats to some of his shipmates that he could kill them and dispose of the bodies with no problems, the taking of all the insults to him as a very personal thing.

When his one friend marries, immediately the world ceases. He pulls in all of his beneficience to this individual. When a second friend marries, he ceases to speak to him. That would be indicative of an egocentric person.

I mentioned the bragging. Other things in his letters that he talked about with one of his girlfriends, "I have probably bored you long enough, right?" "Do I fit the image of what you think a petty officer should be like?" These are separate quotes from different letters. "So all your friends are still drooling over my picture?"

He asks a third person, a person with whom he had had a brief date, if she would miss him and asked if she would write to him, even after he had kind of insulted her.

Mr. HAZELWOOD. When she did, he wrote back saying that his current girlfriend did not want him to correspond with her any more. He had no current girlfriend at that time.

Senator COHEN. I have no more questions, Mr. Chairman.

Senator WARNER. One wrap-up question here. You mentioned that the man was apparently, in your judgment—I do not know quite how you characterize it—alienated from his family. Clarify that for me.

Dr. AULT. I believe that somebody else—the chairman, or someone else—used that term "alienated" sir.

Senator WARNER. Then what was your characterization of the evidence, of how you put it in your opinion?

Mr. HAZELWOOD. Yes, sir, one of his sisters advised that no one in the family knew him very well. As a child, he was a loner. He stayed in his room, in his attic room, as his sister referred to.

Dr. AULT. He had no friends. The sister herself stated, in an interview, that he was largely estranged from other family members.

Senator **Warner**. But the testimony of the family somewhere in this record, and I will eventually find it—to NIS, I expect—condemns him, and is rough and tough on him, is that not correct?

Mr. **Hazelwood**. Yes, sir.

Senator **Warner**. Yet he goes back home at Christmas.

Mr. **Hazelwood**. For the first time in 5 years.

Dr. **Ault**. In addition to that, leaves a letter stating that he loves them, after all this alienation. Then we see this kind of behavior, this unusual behavior, where he says—leaves a note on their bed that says that he loves them. He did not say it face-to-face. He left a note behind, apparently said that he loved them.

Senator **Warner**. To what extent is this relationship with his family—and I will let you characterize it—was that a part of your assessment and figured into the opinion, the conclusions and so forth?

Mr. **Hazelwood**. It is another form of rejection.

Senator **Warner**. So it was a fairly significant part of the factual data that you used for the hypothesis?

Mr. **Hazelwood**. A part of it, sir. Just a part of it.

Senator **Warner**. I think we had best get on with the next witness.

Senator **Cohen**. Just this one point. He goes home for Christmas after 5 years. Was there a reconciliation?

Mr. **Hazelwood**. Not to our knowledge, sir.

Dr. **Ault**. We never heard of one.

Senator **Cohen**. Then why did you draw any implication that he signed a note saying "I love you."

Mr. **Hazelwood**. Because it is the first time he had ever done it, the first time he had ever left a note to his parents expressing love.

Senator **Cohen**. Would that be any indication that there might have been a reconciliation? The man ran off to go in the Navy, he had some hard times with his family, comes home after 5 years, leaves a note for mom and dad, "I love you"?

Dr. **Ault**. It might be an indication he had decided he was going to do himself in, that he had had enough problems. It could be a lot of things. We chose to conclude that it was probably an indication that he had begun to make up his mind that he was not happy with his life and wanted to end it.

Senator **Cohen**. So if he did not say anything, that would have been a normal reaction to his going home for Christmas?

Dr. **Ault**. If he had not said anything, we would not have anything to work with at all.

Mr. **Hazelwood**. But that is what he had done in the past, yes, sir.

Senator **Cohen**. So it would have been a more normal course of conduct for him to continue the alienation with his family?

Mr. **Hazelwood**. Yes, sir.

Senator **Cohen**. Thanks. That is all.

Senator **Warner**. Thank you, gentlemen. It has been a tough job that you have had to perform.

The committee will now hear from Kenneth W. Nimmich, who is the Section Chief of the Scientific Analysis Section of the FBI Laboratory Division. The FBI laboratory conducted an analysis of the rotating band from the projectile that was in the barrel on April 19 in an attempt to determine the presence of any "foreign material." The FBI's analysis was inconclusive.

As the chairman indicated this morning, at the committee's request, Sandia National Laboratories will be conducting an independent analysis of the remainder of the rotating band. Thank you very much, Mr. Nimmich.

STATEMENT OF KENNETH W. NIMMICH, SECTION CHIEF, SCIENTIFIC ANALYSIS SECTION, FBI LABORATORY

Mr. NIMMICH. Thank you, Mr. Chairman and committee members.

I am Kenneth W. Nimmich. I am chief of the scientific analysis section of the FBI Laboratory.

And the FBI Laboratory is the only full-service Federal crime laboratory in the United States. If you have no objection, sir, I would like to enter my statement into the record.

Senator WARNER. Without objection.

Mr. NIMMICH. The Director of the FBI is charged to "operate the Federal Bureau of Investigation Laboratory to serve not only the Federal Bureau of Investigation, but also to provide, without cost, technical and scientific assistance, including expert testimony, in Federal and local courts for all duly constituted law enforcement agencies which may desire to avail themselves of the service."

The services provided include scientific and technical support to investigations, examinations of physical evidence, court testimony and forensic science research and training.

Direct scientific and technical support is frequently provided at crime scenes in major FBI cases, and sometimes to State and local and other Federal law enforcement agencies in cases which achieve national recognition or involve expertise not available to local jurisdictions.

Our primary objective is to maintain a highly professional and thoroughly competent team of forensic experts with a broad range of capabilities to support the varied needs of the Nation's criminal justice system.

The FBI Laboratory is a national resource which has earned a reputation for excellence based on over 50 years of quality service.

Over the years the FBI Laboratory has examined evidence in hundreds of explosions. Through our experience in these cases we have developed a systematic approach to identify the makeup of an improvised explosive device, to include the explosive used, the elements of the initiation system, and any container or housing of the device.

Our system includes a thorough examination of as much material from the scene of the explosion as possible. These examinations take place in the following units. The explosives unit conducts visual and microscopic examinations of bomb remains, commercial explosives and blasting accessories, as well as military explosives and ordnance items, with the goal of reconstructing the explosive device utilized.

Tool mark examinations of bomb components are also performed in the explosive unit.

The materials analysis unit utilizes intrumentation such as infrared spectroscopy, x-ray diffractrometry, pyrolysis gas chromatography/mass spectrometry, and other advanced instruments for identification or comparison of the compositions of paints, plastics, explosives, cosmetics, and tapes.

The elemental and metals analysis unit analyzes a variety of materials for their elemental composition. Among the techniques utilized by this unit are scanning electron microscopy/energy dispersive spectroscopy, inductively coupled plasma atomic emission spectroscopy, and neutron activation analysis.

This unit utilizes SEM/EDS to determine the structural and elemental characteristics of a variety of materials. This technique is non-destructive and permits analysis of individual particles at high magnification.

This technique is used frequently and with much success in forensic science examinations, and has been used in significant investigations, such as product tampering cases.

As a service to and at the request of the Navy, on May 16, 1989, an explosives and hazardous devices specialist from the FBI Laboratory explosives unit examined the explosive damage remaining on the U.S.S. *Iowa* following the April 19, 1989 explosion.

Upon completion of the initial inspection of turret number two, the FBI specialist noticed explosive damage consistent with the deflagration of a large quantity of smokeless powder propellant. No explosives or components which could be associated with an improvised explosive device or initiator were located.

On June 21, 1989, the Naval Investigative Service delivered evidence to the FBI Laboratory which consisted, in part, of propellant samples, improvised timing devices, and portions of four projectile rotating bands. Two of these rotating band samples were obtained from test firings using a timing device, one from a test firing without a timing device, and one from turret number two of the U.S.S. *Iowa*.

The Navy advised that their scientific examinations demonstrated the presence of residue from a timing device in the U.S.S. *Iowa* explosion. The FBI Laboratory was requested to analyze the submitted evidence in an attempt to independently confirm this finding.

Components of the timer as well as contaminants from the propellant sample were analyzed using the scanning electron microscope. Material from between the fin and the slot was sampled from three locations on each of the submitted projectile rotating bands. This material, while still on the band, was examined using light microscopy. The material was then removed from the areas under the fin and separated in a solvent using an ultrasonic cleaner to disperse the particles.

The samples were then filtered and examined using the scanning electron microscope/energy dispersive spectroscopy. One hundred relevant particles from the three separate locations on each of the rotating bands were analyzed for their elemental composition. Particles that were found to occur frequently in a given sample, such as copper particles, were noted as occurring frequently and were no longer recorded.

This is what is meant by the term relevant.

The 1,200 particles thus analyzed were grouped by elemental composition, and the results examined for significant similarities or differences between particle populations.

Particles consisting of aluminum were found frequently on bands from the test firings, both with and without devices. However, only one such particle was found on the band from the U.S.S. *Iowa*. This demonstrates that differences and similarities between particle populations can exist that are independent of the introduction of a timing device.

Therefore, any such differences or similarities require additional scientific scrutiny, such as further characterization of the particles before any significance is attached.

In addition, further investigative scrutiny, such as determining other possible sources for any particles found, is also necessary. No other significant similarities or differences were detected.

Therefore, it could not be determined from this method and this sample whether residue from a device, such as the submitted timing device, was present between the fin and slot of the U.S.S. *Iowa* rotating band.

Polymeric material was found in the U.S.S. *Iowa* band, but due to its charred condition, a definite conclusion concerning its identity could not be made. Because our analyses did not detect any significant differences or similarities between the particles analyzed from all submitted bands, we identified the need for further testing.

We communicated this to the Navy, and they advised that further testing by another laboratory had yielded significant results. They requested that we conduct no further examinations, and they retrieved the unexamined portions of the rotating bands.

Based on the limited analyses we performed within the scope of the Navy's request, no conclusion can be drawn by the FBI Laboratory as to the presence or absence of an initiating device in the items of evidence from the U.S.S. *Iowa*.

Senator WARNER. If I could ask for a word of clarification, Mr. Chairman. By initiating device, you mean really foreign material, as such, that would not ordinarily have been used in loading and firing this gun?

Mr. NIMMICH. Well, sir, it is hard to tell, because there was foreign material there, but we could not determine where that may have originated.

Chairman NUNN [presiding]. Let me just ask you a couple of questions here. If I understand what you are saying, you are saying the FBI Laboratory was unable to detect either similarities or differences among the rotating bands, is that right?

Mr. NIMMICH. Yes, sir.

Chairman NUNN. You could not tell any difference between the ones that were involved in the *Iowa* explosion, the two bands that were on projectiles involved in explosions deliberately seeded with electronic timing devices, and a band from a projectile involved in an explosion without any timing device or other foreign material?

Mr. NIMMICH. That is correct, sir. Therefore, we asked the Navy for further tests.

Chairman NUNN. You are not saying the Navy was wrong?

Mr. NIMMICH. No, sir.

Chairman NUNN. You are not saying they were right?

Mr. NIMMICH. That is correct, sir. I am saying, from the tests that we performed, we could not make a determination.

Chairman NUNN. Does that mean that your methods are not as thorough as the Navy's? What does it mean?

Mr. NIMMICH. Well, sir, we had several questions——

Chairman NUNN. Do not use the word thorough. Do you have the capabilities that the Navy has? Do you have equivalent capabilities of the Navy? Do you have more capabilities in this testing area, or do you have less?

Mr. NIMMICH. We had a question arise, sir, to tell us whether we did have the capabilities or not. Our examination failed to tell any differences, even between those bands which had a device placed in it, and those which did not.

We therefore asked several questions: Did the device or residues of the device go out the back end of the weapons, because the chamber was open? Are the residues of the device focused within the 360-degree circle of the ring? Or are they present in minute enough quantities that our equipment is not sensitive enough to determine that?

Chairman NUNN. What did you decide?

Mr. NIMMICH. Well, we asked the Navy to conduct an additional test for us. At that time they said they had another laboratory working on it, and that no further testing would be necessary from us.

Chairman NUNN. You asked the Navy to do another test you felt you needed to have for your own basis?

Mr. NIMMICH. Yes, sir.

Chairman NUNN. Does that mean you did not have the capability of doing that test yourself?

Mr. NIMMICH. That is correct. It was a test-firing of a 16-inch weapon.

Chairman NUNN. There have been all sorts of stories written. I am just trying to assess whether the public has gotten the full story and the accurate story of what you are saying here.

Let me ask you again, do you think the Navy has more sophisticated, more state-of-the-art capability in this testing area than you do, or less?

Mr. NIMMICH. The Navy has much more sensitive instrumentation than we do for the testing that they have done, yes, sir.

Chairman NUNN. Okay. So if they have got more sensitive instrumentation, then the fact that you could not determine it, one way or the other, would not really tell us anything, would it?

Mr. NIMMICH. That is correct, sir.

Chairman NUNN. Could you have done more testing than you did do? Was there any other practical steps that you could have taken that you did not take?

Mr. NIMMICH. We could have, however, the general consideration would be to do as minimal damage to the items of evidence as possible. So, therefore, our approach to this was to find out whether we were capable of determining or finding any of that residue. That was the additional test that we asked from the Navy.

At that point, we found that our equipment would not detect the materials that were left, then we would have to say that we were incapable of doing that.

Chairman NUNN. Did the Navy actually carry out the test that you asked them to carry out?

Mr. NIMMICH. I am sorry, sir, I do not know.

Chairman NUNN. They never did get back with you after that?

Mr. NIMMICH. That is correct.

Chairman NUNN. Would there have been a need for them to get back to you?

Mr. NIMMICH. No, sir, we were providing a service; they said thank you for the service.

Chairman NUNN. In other words, if you could not go any further with your testing, even if they did the tests that you asked for, there would not be any need for them to get back to you?

Mr. NIMMICH. That is correct.

Chairman NUNN. You are not saying there is anything the Navy has done wrong, then?

Mr. NIMMICH. No, sir, I am not saying that.

Chairman NUNN. In your statement you indicated that you returned portions of the *Iowa* rotating band to the Navy. As I earlier indicated, I believe this morning, Sandia National Laboratories will be analyzing those portions of the band in an effort to independently determine if there are foreign materials present.

How much of the rotating band is left? Is there enough left for Sandia to do a test?

Mr. NIMMICH. We received approximately 16 inches of copper rotating band during our testing procedure. We cut it approximately in half. The Navy retrieved half of that during their testing process.

The other one half was one we ran during our testing. We had opened the slot. I believe it is approximately 10 inches long, and that has been returned to them without further examination.

Chairman NUNN. Do you think that is enough for Sandia to conduct a test?

Mr. NIMMICH. I believe that is all that there is, sir.

Chairman NUNN. I know that is all there is, but that still does not answer the question. Based on your own expertise, do you think there is enough left for them to do a meaningful test?

Mr. NIMMICH. Yes, sir. I think we did minimal disturbance to any material that was in there and, yes, they can examine it.

Chairman NUNN. Do you have concern that the rotating band might have been contaminated either prior to or subsequent to the explosion?

Mr. NIMMICH. Not so much a concern. We were advised at the time we began our examination that in order to remove the projectile from the 16-inch gun on board the *Iowa* that a material called a Break-free was applied to the inside of the barrel.

As we opened the flap or the fin, lifted the fin, the material underneath there was somewhat oily, which was not true with the other three rotating bands. So that there was some material that had been added to it.

Chairman NUNN. During testimony from the Navy witnesses last month, they stated that the description of the tests and test results from the Navy's testing at their activity in Crane, IN, had been made available to the FBI. Is that correct?

Mr. NIMMICH. That is correct, sir.

Chairman NUNN. Are you up to date, then, on what the Navy has done?

Mr. NIMMICH. I have read the report from Crane. However, I have to qualify that by saying, but I am not competent in the technology that they have applied to it and, therefore, I am not in a position to be able to say that the work is correct or not.

I am assuming that Crane is a very reputable laboratory.

Chairman NUNN. So, you are really not in a position to tell us your opinion about their testing methodology and results?

Mr. NIMMICH. No, sir, I am sorry I am not.

Chairman NUNN. Thank you very much. We appreciate your being here.

[The statement of Mr. Nimmich follows:]

PREPARED STATEMENT OF KENNETH W. NIMMICH, SECTION CHIEF, SCIENTIFIC ANALYSIS SECTION, FBI LABORATORY

FUNCTION OF THE FBI LABORATORY

The FBI Laboratory is the only full service Federal crime Laboratory in the United States and the Director of the FBI is charged to "Operate the Federal Bureau of Investigation Laboratory, to serve not only the Federal Bureau of Investigation, but also to provide, without cost, technical and scientific assistance, including expert testimony in Federal or local courts, for all duly constituted law enforcement agencies, which may desire to avail themselves of the service." The services provided include scientific and technical support to investigations, examinations of physical evidence, court testimony and forensic science research and training.

Direct scientific and technical support is frequently provided at crime scenes in major FBI cases and sometimes to state and local and other federal law enforcement agencies in cases which achieve national recognition or involve expertise not available to local jurisdictions.

Our primary objective is to maintain a highly professional and thoroughly competent team of forensic experts with a broad range of capabilities to support the varied needs of the Nation's criminal justice system. The FBI Laboratory is a national resource which has earned a reputation for excellence based on over 50 years of quality service.

Over the years, the FBI Laboratory has examined evidence in hundreds of explosions. Through our experience in these cases, we have developed a systematic approach to identify the make-up of an improvised explosive device, to include the explosive used, the elements of the initiation system, and any container or housing of the device. Our system includes a thorough examination of as much material from the scene of the explosion as possible. These examinations take place in the following units:

The Explosives Unit conducts visual and microscopic examinations of bomb remains, commercial explosives and blasting accessories as well as military explosives and ordnance items with the goal of reconstructing the explosive device utilized. Toolmark examinations of bomb components are also performed by the Explosives Unit.

The Materials Analysis Unit utilizes instrumentation such as infrared spectroscopy, X-ray diffractrometry, pyrolysis gas chromatography/mass spectrometry and other advanced instruments for identification or comparison of the compositions of paints, plastics, explosives, cosmetics, and tapes.

The Elemental and Metal Analysis Unit analyzes a variety of materials for their elemental composition. Among the techniques utilized by this unit are scanning electron microscopy/energy dispersive spectroscopy (SEM/EDS), inductively coupled plasma atomic emission spectroscopy and neutron activation analysis.

This unit utilizes SEM/EDS to determine the structural and elemental characteristics of a variety of materials. This technique is nondestructive and permits analysis of individual particles at high magnification. This technique is used frequently and with much success in forensic science examinations, and has been used in significant investigations such as product tampering cases.

REQUESTS BY THE U.S. NAVY REGARDING THE U.S.S. IOWA

As a service to, and at the request of the Navy on May 16, 1989, an Explosives and Hazardous Devices Specialist from the FBI Laboratory Explosives Unit examined the explosive damage remaining on the U.S.S. *Iowa* following the April 19, 1989 explosion. Upon completion of the initial inspection of turret number two the FBI specialist noted explosive damage consistent with the deflagration of a large quantity of smokeless powder propellant. No explosives or components which could be associated with an improvised explosive device or initiator were located.

On June 21, 1989, the Naval Investigative Service delivered evidence to the FBI Laboratory which consisted, in part, of propellant samples, improvised timing devices and portions of four projectile rotating bands. Two of these rotating band samples were obtained from test firings using timing devices, one from a test firing without a timing device, and one from turret number two of the U.S.S. *Iowa*. The Navy advised that their scientific examinations demonstrated the presence of residue from a timing device in the U.S.S. *Iowa* explosion. The FBI Laboratory was requested to analyze the submitted evidence in an attempt to independently confirm this finding.

ANALYSES AND FINDINGS

Components of the timer, as well as contaminants on the propellant sample, were analyzed using SEM/EDS. Material from between the "fin" and "slot" was sampled from three locations on each of the submitted projectile rotating bands. This material, while still on the band, was examined using light microscopy. The material was then removed from areas under the "fin" and separated in a solvent using an ultrasonic cleaner to disperse the particles. The samples were then filtered and examined using SEM/EDS. One hundred relevant particles from the three separate locations on each of the rotating bands were analyzed for their elemental composition. Particles that were found to occur frequently in a given sample, such as copper particles, were noted as occurring frequently and were no longer recorded. This is what is meant by the term "relevant."

The 1,200 particles thus anlayzed were grouped by elemental composition, and the results examined for significant similarities or differences between particle populations.

Particles consisting of aluminum were found frequently on bands from the test firings both with and without timing devices. However, only one such particle was found on the band from the U.S.S. *Iowa*. This demonstrates that differences and similarities between particle populations can exist that are independent of the introduction of a timing device. Therefore, any such differences or similarities require additional scientific scrutiny, such as further characterization of the particles, before any significance is attached. In addition, further investigative scrutiny, such as determining other possible sources for any particles found, is also necessary.

No other significant similarities or differences were detected. Therefore, it could not be determined from this method and this sample whether residue from a device such as the submitted timing devices was present between the "fin" and "slot" of the U.S.S. *Iowa* rotating band.

Polymeric material was found in the U.S.S. *Iowa* band but due to it's charred condition, a definite conclusion concerning it's identity could not be made.

Because our analyses did not detect any significant differences or similarities between the particles analyzed from all the submitted bands, we identified the need for further testing. We communicated this to the Navy, and they advised that further testing by another laboratory had yielded significant results. They requested that we conduct no further examinations and they retrieved unexamined portions of the rotating bands.

Based on the limited analyses we performed within the scope of the Navy's request, no conclusion can be drawn by the FBI as to the presence or absence of an initiating device in the items of evidence from the U.S.S. *Iowa*.

Chairman **Nunn**. I want to thank all of our witnesses today. The committee will conclude this day's hearing, but we will be deliberating further on this subject in the future.

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR ALAN DIXON

Senator DIXON. Does the Federal Bureau of Investigation's (FBI) Behavioral Sciences Department always work just off synopses of interviews?

Mr. NIMMICH. The Behavioral Sciences Units (BSU) of the FBI's National Center for the Analysis of Violent Crime (NCAVC) uses a variety of sources of factual information when doing an assessment. Sources of factual information include, but are not limited to: the reviews of investigators' records of interviews; reviews of transcripts of interviews; analysis of laboratory and/or forensic reports of evidence; reviews of medical reports; interviews and further tasking of investigators conducting the investigation.

The Naval Investigative Service (NIS) interview reports are, in fact, very similar in format to reports that the FBI has used successfully in court for years to record the results of interviews. They are obviously once removed from the actual conversation. However, because their purpose is to assist the memory of the individual who did the interview—and we spent a great deal of time with those individuals—it was easy enough for us to ask the interviewers themselves for clarification of any of the parts that needed elucidation. Thus, we could eliminate material that, in our experience, was not important to the assessment. We have found our assessment technique to be successful and utilize it in the cases presented to us for analysis.

While the Smith and Esty interviews provided further confirmation of our opinion that Clayton Hartwig committed suicide. An additional value of the transcript of the total interviews, as opposed to the investigator's reports of interviews was that we could see and, in some instances, actually hear recorded interview techniques of the NIS Agents. Our conclusion was that their interview techniques were very good. A review of the transcript indicates that the questions were open ended and not leading. The interviewer did not attempt to place words in the mouth of the subjects of the interview. It gives us reason to place faith in the total interview process.

It is our opinion that the NIS Agents did not write their interview synopsis in a subjective manner. The method utilized by NIS in summarizing interviews is quite acceptable within the criminal justice system to include courts of law.

Senator DIXON. Hartwig had also indicated in letters and in a conversation the night prior to his death that he was going to work in the Navy's physical security program. Maybe he would have been made just a security guard on a gate. But would he not have been given special training by the Navy because some of the duties for this type of assignment require exactly what he claimed he was going to be trained to do?

How did you come to the conclusion that he was not going to have the job he wanted?

(If they say the Navy NIS told them Hartwig was not going to have this assignment):

Who told Hartwig he was not going to this new assignment?

If Hartwig was, indeed, told by someone in Naval personnel that his next assignment was going to be in physical security, then he was not lying, and would that not negate your theory?

Mr. NIMMICH. The U.S. Navy is the appropriate organization to comment on special training for Navy personnel.

The information provided to the BSU in our first meeting with NIS investigators is that Hartwig was not eligible for "shore assignment in physical security" because he had been the subject of a Captain's Mast. Special Agent Ed Goodwin, NIS, confirmed this information again on February 1, 1990. Goodwin further advised us that Hartwig's chances for transfer to a physical security assignment were known to be nonexistent by Navy personnel who would have processed his request.

Part of the second question addresses the idea that "Maybe he would have been made just a security guard on a gate." The implication of the question appears to be that even if he were assigned somewhere near what he wanted, somehow he would not be exaggerating or prefabricating. The point is that Hartwig, even if he were going to be assigned to some protective duty, would know that what he described in his own letters was not reality, but self aggrandizement. His statements in his letters were at least exaggerations, if not more.

Whether or not Hartwig knew about the results of his transfer, the fact is that he made an effort to change career fields from a gunner's mate to what he perceived as a more prestigious position in physical security, continuing his life in the same vein as before; the desire to be what he was not—a mysterious and heroic person in a violent profession.

Senator DIXON. Given the fact that you were provided both selected and mere synopses of interviews which were really subjective judgments of the NIS Agents, don't you think you should review all the complete interviews and use them to reevaluate your equivocal death analysis, or that this committee should have the GAO take all the interviews and have them reviewed by other outside experts? In other words, what is it going to take to get the full and complete story about what happened on the *Iowa*?

Mr. NIMMICH. As we have stated in our testimony, the quality and quantity of information provided to us by the NIS in this investigation was excellent, based on our 14 years experience in this field. The format of the information is consistent with law enforcement reporting, and the quality of such a nature that we were able, based on our experience in violent crimes, to provide an equivocal death analysis based on facts.

As we have further testified, we not only had the investigative results to analyze, but we also met with the investigators on three separate occasions, each meeting lasting several hours. They answered in detail any questions we had about what exactly was said in any given interview, and they provided us with detailed verbal background on the family. To date, we have maintained communication with NIS about the results of their investigation, and we have seen no new facts which would cause us to change our opinion.

We encourage the committee to have the interview results reviewed by outside experts. The experts used by the committee should be qualified to do an analysis in this type of case, and they should have access to the interviewers so that they can get an accurate account of the interviews.

The U.S. Navy's complete report on the U.S.S. *Iowa* should be the best assessment of what occurred.

[Whereupon, at 3:41 p.m., the committee adjourned, subject to the call of the Chair.]

REVIEW OF THE DEPARTMENT OF THE NAVY'S INVESTIGATION INTO THE GUN TURRET EXPLOSION ABOARD THE U.S.S. "IOWA"

FRIDAY, MAY 25, 1990

U.S. SENATE,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

The committee met, pursuant to notice, at 9:06 a.m., in room SH-216, Hart Senate Office Building, Senator Sam Nunn (chairman of the committee) presiding.

Committee members present: Senators Nunn, Levin, Bingaman, Glenn, Gore, Warner, and Cohen.

Also present: Senator Metzenbaum.

Committee staff members present: Arnold L. Punaro, staff director; Andrew S. Effron, general counsel; Richard D. DeBobes, counsel; and Marie Fabrizio Dickinson, assistant chief clerk.

Professional staff members present: Richard E. Combs, Jr., Creighton Greene, John J. Hamre, William E. Hoehn, Jr., David S. Lyles, and Frederick F.Y. Pang.

Minority staff members present: Patrick A. Tucker, minority staff director and counsel; Romie L. Brownlee, deputy staff director for the minority; George W. Lauffer and Mark B. Robinson, professional staff members.

Staff assistants present: Barbara L. Braucht, Kelli J. Pronovost, Debra A. Rice, and Mickie Jan Wise.

Committee members' assistants present: Kenneth N. Luongo, assistant to Senator Levin; John Gerhart, assistant to Senator Bingaman; and Terence M. Lynch, assistant to Senator Shelby.

OPENING STATEMENT OF SENATOR SAM NUNN, CHAIRMAN

Chairman NUNN. The Armed Services Committee will come to order.

The committee meets this morning for the fourth in a series of hearings on matters associated with the explosion on April 19, 1989 in the center gun of turret II on board U.S.S. *Iowa* which resulted in the death of 47 naval personnel.

The committee first heard on November 16, 1989 from Rear Adm. Richard Milligan, the Navy's investigating officer, and from other Navy witnesses who assisted in the investigative effort. We then heard from Capt. Fred Moosally, the commanding officer of the U.S.S. *Iowa* at the time of the explosion. Finally, the committee heard from three witnesses from the Federal Bureau of Investigation concerning the FBI's "equivocal death analysis". At that last hearing we also heard from the chief of the FBI's laboratory on the FBI's analysis of the rotating band from the projectile that was in the barrel on the day of the explosion.

This morning, the committee will hear from Mr. Frank C. Conahan, Assistant Comptroller General, National Security and International Affairs Division of the General Accounting Office; Dr. Richard L. Schwoebel, Director of Components, Sandia National Laboratories; and Mr. Paul W. Cooper and Dr. Karl W. Schuler, who were both members of Sandia's technical team that conducted the effort that was headed up by Dr. Schwoebel.

The committee asked the GAO first of all to assess the adequacy of the Navy's investigation into the explosion and to evaluate the Navy's conclusions, particularly those relating to the safety of the U.S.S. *Iowa* and its gun turrets. We also asked the General Accounting Office to inquire into certain other issues that arose during the course of the Navy's investigation, but which were not pursued by the investigating officer. Those issues related to the U.S.S. *Iowa* and her sister battleships and involved the priority of officer and enlisted manning and the quality of personnel; the adequacy of training on the 16-inch guns; the responsiveness of the Navy to repair and repair part requests; the adequacy of various inspections and surveys; the authorization for utilization of U.S.S. *Iowa* for experimental purposes; and the "employment plan" for battleships.

Last October I asked the General Accounting Office to provide interim reports on a monthly basis and for any conclusions that may be reached even on an interim basis as to the safety of the ship. We appreciate the General Accounting Office doing that and working hand-in-hand with our staff during this period.

In November 1989 Senator Warner, Senator Bingaman, and I then urged Sandia National Laboratories in Albuquerque, New Mexico to assist the General Accounting Office by undertaking a technical analysis of the Navy's tests, since we viewed it as extremely important for the Navy's technical findings to be evaluated by an expert independent source. I ask unanimous consent that our letters to the General Accounting Office and to Sandia National Laboratories be entered into the record. Without objection, they will be entered into the record.

[The information referred to follows:]

U.S. SENATE,
COMMITTEE ON ARMED SERVICES,
Washington, DC, October 3, 1989.

Mr. CHARLES A. BOWSHER,
Comptroller General,
General Accounting Office, Washington, DC.

DEAR MR. BOWSHER: As you may be aware, the Senate Armed Services Committee is presently reviewing the Report of Investigation into the explosion on U.S.S. *Iowa* on April 19, 1989. We are planning to hold hearings as soon as possible after we complete conference with the House on the Department of Defense Authorization bill.

My staff has held preliminary discussions of an exploratory nature with personnel of your office to alert them to a need for your assistance in reviewing the voluminous report in an attempt to assess the adequacy of the investigative effort and to validate the conclusions of the investigation, particularly those relating to the safety of U.S.S. *Iowa* and its gun turrets. One purpose of this letter is to reaffirm that request for assistance. I realize that this is a major undertaking and thus may be quite time consuming. I would ask, therefore, that I receive interim reports on a monthly basis summarizing the actions that have been accomplished and such conclusions that may be reached, even on an interim basis, as to the safety of the ship.

I am also concerned with certain issues which arose during the Navy's investigation, but which were not pursued since they were not considered to be immediately relevant to the specific task at hand, i.e. the cause of the explosion, once equipment malfunction and accident had been ruled out. Accordingly, I request that GAO inquire into these other "beyond scope" issues both with respect to U.S.S. *Iowa* and her sister battleships, such as the priority of officer and enlisted manning; adequacy of training on the 16-inch guns; responsiveness of the Navy to CASREPs and repair parts requests; adequacy of various inspections and surveys conducted on board; authorization for utilization of the ship for experimental purposes; and the "employment plan" for battleships. Once again, I realize that this effort may take some time and I would like to have monthly reports on these issues as well.

I appreciate your assistance in this important matter. The point of contact on my staff will be Rick DeBobes, who may be reached at 224-7530.

Sincerely,

SAM NUNN, *Chairman.*

U.S. SENATE,
COMMITTEE ON ARMED SERVICES,
Washington, DC, November 22, 1989.

Dr. ALBERT NARATH,
President, Sandia National Laboratories,
Albuquerque, NM.

DEAR DR. NARATH: We are writing to you concerning a matter which is of significant interest to the Committee on Armed Services. The Committee is conducting a series of hearings on the U.S. Navy's investigation into the explosion that occurred on April 19, 1989 in the center gun of turret II on board U.S.S. *Iowa* resulting in the death of 47 Navy personnel.

In order to enable the Committee to fully explore this matter, the assistance of the General Accounting Office (GAO) was requested. A copy of Chairman Nunn's letter to GAO is enclosed. The GAO, in turn, by letter of October 26, 1989 to Dr. Schwoebel has requested the assistance of Sandia National Laboratories in reviewing technical aspects of the Navy's investigation. As we understand it, GAO has determined after extensive consultation that Sandia is the best place to assist with the technical aspects. The committee staff has been advised that Sandia is reluctant to undertake this project.

It is extremely important to the Committee that the Navy's technical findings be evaluated by an independent source. Additionally, the Navy's technical teams' final report has now been received and it has been ascertained subsequent to the submission of the GAO letter that a ten inch segment of the rotating band from *Iowa's* projectile is available for analysis. Independent analysis of the band to determine if foreign material is present would be of significant assistance to our effort.

Accordingly, we request that you reconsider GAO's request and we strongly urge you to agree to analyze the *Iowa's* rotating band and perform such other technical analysis as may be possible with respect to GAO's request as it is being made on behalf of this Committee.

Sincerely,

SAM NUNN,
Chairman.
JOHN WARNER,
Ranking Minority Member.
JEFF BINGAMAN,
Committee Member.

Chairman NUNN. The purpose of this morning's hearing is to receive testimony as to the results of both GAO and Sandia's efforts to date. I want to emphasize that the Navy has been cooperative throughout this period with our committee, the General Accounting Office and with Sandia. This has been particularly true at the working level of the Navy. It would have been impossible for GAO and Sandia to have accomplished very much without the assistance of the Navy. As will become clearer as the morning goes on, additional action on the part of the Navy will be essential for Sandia's work to be carried to its logical conclusion. In this connection, I would like at this point to enter into the record my letter of May 14, 1990, to the Chief of Naval Operations, Admiral Trost, which I wrote to emphasize the importance I attached to Sandia's findings which were brought to the committee's attention on May 11. Without objection, that letter will also be entered into the record.

[The information referred to follows:]

U.S. SENATE,
COMMITTEE ON ARMED SERVICES,
Washington, DC, May 14, 1990.

Admiral C.A.H. TROST, USN,
Chief of Naval Operations,
The Pentagon, Washington, DC.

DEAR ADMIRAL TROST: I understand that the then Vice Chief of Naval Operations, Admiral Leon A. Edney, USN, was made aware on May 11, 1990 of the recent finding by Sandia National Laboratories that the explosion on board U.S.S. *Iowa* may have been caused by a high-speed overram of the bag charges and impact sensitivity of the propellant. Pursuant to this Committee's request, Sandia National Laboratories is performing an analysis of the Navy's technical investigation.

As soon as the Committee staff director, Arnold Punaro, was informed on May 11th of Sandia's findings, he directed Rick DeBobes of the Committee staff to contact Admiral Edney directly to ensure that Admiral Edney was personally aware of Sandia's findings and concerns. This information was initially provided by the Sandia project director, Dr. Richard L. Schwoebel, to Captain Joseph D. Miceli, USN, Director of the Technical Support Team for the U.S.S. *Iowa* investigation, in view of Dr. Schwoebel's concern with the safety of continued operation of 16-inch guns in the fleet.

I further understand that the Navy's initial reaction, as conveyed to Committee staff, was that Sandia's laboratory tests and findings, since they were not performed on 16-inch guns, were not relevant and that no action need be taken vis-a-vis the deployed battleship, U.S.S. *Missouri.*

The purpose of this letter is to ensure that the Navy is seriously considering Sandia's findings in making judgments relating to the safety of the crews of the battleships. At a minimum, I want to ensure that the Navy will actively and expeditiously conduct all necessary tests to determine if Sandia's tests can be duplicated on the 16-inch gun and its associated equipment. I strongly recommend that Sandia personnel be involved in these tests in view of their expertise and experience and so they can independently verify any additional Navy tests.

The Committee is not in a position at this time to make a judgment as to the safe operation of 16-inch guns in the fleet. We do intend to hold hearings in the near future to inquire further into this matter. I am sure that you share my concern that the paramount interest is the safety of the crews of the battleships.

Sincerely,

SAM NUNN, *Chairman.*

Chairman NUNN. On May 11 after receiving this information, the committee immediately notified the Navy. We wanted to make sure that those responsible for the safety of the battleships had access to this information immediately. I stressed the need for the Navy to seriously consider these findings and to expeditiously conduct additional tests with the involvement of the Sandia experts.

We had originally planned only one witness from Sandia this morning. In view of the test results that occurred at the Navy's facility at Dahlgren yesterday, we have also asked Mr. Cooper and Dr. Schuler to testify. They participated in those tests which were based upon the data that Sandia provided to the Navy and were part of the follow-up effort the committee requested based on the Sandia theory that will be outlined this morning.

The testimony we will hear this morning will expose significant shortcomings in the Navy's investigation into this tragic incident.

The testimony also documents serious deficiencies in the Navy's treatment of the battleships, both in terms of officer and enlisted manning and in terms of the training given to the crews who man the 16-inch guns. The testimony will cast grave doubt on the Navy's finding concerning the presence of foreign material in the rotating band of the *Iowa* projectile. As those who followed this matter will recall, this was a key element in the Navy's foundation for finding that the explosion occurred as a result of a wrongful and intentional act. The testimony today will essentially eviscerate the Navy's conclusion that the explosion on the U.S.S. *Iowa* was the result of a wrongful intentional act.

Finally, I would note that the effort of this committee has been directed towards finding out what happened so that the appropriate action can be taken to ensure that it will never happen again. In other words, our primary concern has been and is the safety of the crews on our ships.

Gentlemen, we welcome you here today, and we look forward to your testimony. We will hear first from Mr. Frank Conahan, and we will then hear from Dr. Schwoebel.

Before hearing from the witnesses, however, I would ask Senator Warner for any opening remarks he would like to make.

Senator WARNER. Mr. Chairman, first I wish to commend you and members of this committee for certain initiatives that you have taken which have led to the production of this evidence which we will consider today. In my judgment, however, it is far too early to jump to any conclusions. The evidence that we will receive today represents certain tests taken first by Sandia and subsequently by the Navy, and we need an additional period of testing.

The Secretary of the Navy has directed at least 2 more weeks of testing, within which time you have to establish the key fact: Is there a linkage between your discovery that the powder will ignite under certain mechanical pressures and certain geometric orientation of the capsules of powder within the bags, and the operation of this particular gun mount and mounts like it, which have operated in the U.S. Navy since the close of World War II tens of thousands of times without such a problem?

So, Mr. Chairman, I regret that certain elements of the media have used the words that there has been a "cover-up" and that the Navy should apologize. It is far too early to make such pronouncements or reach such conclusions. We must—in the sense of fairness to the families, to the emotions that are evoked by this continuing investigation, to the sorrow they have suffered, to the Navy itself, to the reputation of the Navy—not jump to these conclusions too quickly.

I think the Secretary of the Navy and the senior officers made a prudent decision yesterday to discontinue further training using these 16-inch guns and to reopen the investigation to receive the evidence which you have produced thus far and will continue to produce in the weeks to come.

I commend you for what you have done, but in a sense of fairness let us not leap to conclusions.

Thank you, Mr. Chairman.

Chairman NUNN. Thank you, Senator Warner. Senator Cohen, did you have a statement?

Senator COHEN. Just a few comments, Mr. Chairman.

If I could follow up on what Senator Warner has said. The purpose of this hearing is not to gloat or to try to humiliate the Navy because the Navy, after all, is in the business of protecting our national security and the safety of all of us. I think it will hopefully seek a measure or touch of humility.

In my judgment there clearly was a rush to judgment. A possibility was wrapped up by investigators and psychological architects into probabilities that were then paraded around as certitudes. Faulty equipment was ruled out, and that left only human error. Human error took on the dimensions of a disturbed and unbalanced young man who murdered 46 of his shipmates.

I must tell you, Mr. Chairman, that I was astonished to listen to the evidence that was presented to justify the conclusion that a sick and twisted soul was in all probability responsible for this disaster. As I sat here during the course of that hearing, the words kept going through my mind—the expression that through jaundiced eyes everything looks yellow. I think that was the situation that I heard during our previous hearing.

Guilt was established, according to one writer, by gestalt, and I think it is important that we take care. We are now debating an anticrime bill with very serious penalties imposed upon individuals who are convicted under that particular legislation. Whenever someone's liberty or life is at stake, we must take great care in arriving at our conclusions.

I would like to point out I do not believe that was the case here. As a consequence, at least the lives of other sailors may have been jeopardized as a result. We do not yet know, and we will reserve judgment on that. Certainly reputations were ruined. It was a very famous poet who said that someone who steals your purse from you steals nothing but trash, but when you filch from me my good name you rob me of that which does not enrich you but leaves me poor indeed. That is what occurred, I think, with respect to Mr. Hartwig and certainly Mr. Truitt.

As Senator Warner has indicated, perhaps the most melancholy wounds of all are those that are self-inflicted; indeed, perhaps even to the Navy itself, because if in fact the evidence shows that it was something other than a deliberate act, I think that the Navy will have to do a great deal to rehabilitate itself in terms of its investigative activities.

So I withhold judgment as well, but I must tell you that the case that has been presented to date left a good deal to be desired, in my mind.

Chairman NUNN. Thank you very much, Senator Cohen.

I do think that not jumping to final conclusions as to what caused this are in order here. I do not know that we are going to find today what the cause was. I think that we are going to find that the previous findings are in very serious question.

Any other opening statements? Senator Bingaman.

Senator BINGAMAN. Mr. Chairman, I do commend you and Senator Warner for continuing to pursue this matter. I think it is very important and a matter which the committee has taken a very responsible role in. I think GAO and Sandia deserve great credit for the work they have done. Obviously the Navy has been very cooperative.

I agree that the purposes of the effort at this point are first to ensure that it does not occur again and, second, to clear the record, correct and clear the record of Seaman Clayton Hartwig. If the evidence is as I understand it to be, I believe that clearing the record is essential as part of this. I am looking forward to the testimony.

Chairman **Nunn**. Senator Thurmond has asked that his prepared statement be made a part of the record.

[The prepared statement follows:]

Prepared Statement of Senator Thurmond

Mr. Chairman, I join you in welcoming Mr. Conahan and Dr. Schwoebel to this hearing on the continuing investigation into the tragic incident aboard the battleship *Iowa*.

Since that tragic day in April, the people of this Nation have been subjected to speculative reports regarding the cause of the explosion in the gun turret. I have been dismayed over these reports, and expect that they have caused additional mental anguish to the families of the 47 sailors killed in the explosion.

Yesterday's dramatic announcement that the Navy suspended all live firing of the battleships' 16-inch guns because of an unexplained ignition of powder bags adds another perspective to the incident. Although we should not jump to conclusions, I believe the Navy's action, coupled with the findings of the Sandia National Laboratory, jeopardizes the Navy's original findings on the explosion.

Mr. Chairman, this committee, under your leadership, directed the General Accounting Office to conduct the follow-up inquiry that contributed to this significant turn of events. Although it may take some time to determine the actual cause of the explosion, I believe yesterday's action is a first step in clearing the name of the sailor so maligned by the Navy's findings.

We cannot bring back the lost lives; however, we can ensure that all the facts behind the accident are identified and that corrective action is taken to preclude a recurrence. I hope the Navy does not dally in this effort, so we can get this tragic incident behind us.

Thank you, Mr. Chairman.

Chairman **Nunn**. Thank you. Mr. Conahan.

STATEMENT OF FRANK C. CONAHAN, ASSISTANT COMPTROLLER GENERAL, NATIONAL SECURITY AND INTERNATIONAL AFFAIRS DIVISION, GENERAL ACCOUNTING OFFICE, ACCOMPANIED BY MARTIN FERBER, DIRECTOR, NAVY ISSUES GROUP, GENERAL ACCOUNTING OFFICE

Mr. **Conahan**. Thank you, Mr. Chairman. With me this morning is Mr. Martin Ferber, who is the Director of our Navy Issues Group at the General Accounting Office.

I would like to point out at the outset we have a corollary work underway concerning this matter for Mary Rose Oakar over in the House of Representatives and Senator Metzenbaum, and I would like to recognize that some of the work we have done, and perhaps some of the things we will be saying today, was done as a result of their interest in this matter as well.

Chairman **Nunn**. Thank you.

Senator **Warner**. But there is no separation, as such, between what you will report as a consequence of their initiatives and the initiatives of Chairman Nunn?

Mr. **Conahan**. No, sir.

Senator **Warner**. The facts are the same that will be forthcoming?

Mr. CONAHAN. Correct. Yes, indeed.

Chairman NUNN. Thank you.

Mr. CONAHAN. As you mentioned at the outset, Mr. Chairman, we were asked to (1) conduct an independent investigation of the Navy's technical analysis and the likely causes of the explosion; (2) review the safety aboard the battleships; (3) examine manning and training issues raised by the *Iowa* commanding officer after the explosion; and (4) review the battleship's employment plans and mission.

Working with this committee, we arranged for the Department of Energy's Sandia National Laboratories, to conduct a technical analysis and review the adequacy of the Navy's technical investigation. Dr. Schwoebel and his colleagues are here today to discuss why Sandia's analysis could not corroborate the Navy's finding and their conclusion of another plausible cause for the explosion.

I will look forward to their discussion on that matter and then briefly discuss the other matters that you asked us to address, Mr. Chairman. First, I would discuss a series of safety issues which indeed do raise concerns about the general safety of the ship. I will then discuss manning and training issues that raise questions concerning general readiness of battleships. I would like to say a few words about the mission of the battleships, that you requested us to review, we address particularly in our changing world environment, and finally the utility and supportability of the two remaining battleships after the presently planned retirement of the other two battleships.

First, a few words about safety. The Navy's investigation of the explosion found that safety policies and procedures simply were not being followed aboard the ship. There are a number of examples of that. Perhaps one of the better examples is that although no spark-producing items are allowed in the turrets, items such as cigarette lighters, rings, and keys were found in the remains of the deceased sailors.

The Navy's investigation at the time also noted that *Iowa* personnel had improperly approved and were conducting gunnery experiments. Ship personnel were loading inappropriate projectile and powder combinations when the explosion occurred. The Navy Inspector General subsequently investigated and reported the experiments, and concluded that the firings in question on the *Iowa* were, in fact, improperly authorized and contrary to Navy procedures. His report concluded that the safety hazard posed to the *Iowa*'s crew by the experiments was at best undetermined. I expect that that conclusion needs further exploration, particularly in view of what we will hear a little later on this morning. My prepared statement discusses other safety and serviceability issues, but let me move on to the manning and training issues that you referred to.

We found that battleships, in comparison to other surface ships, were not assigned an equal share of authorized enlisted supervisory personnel or personnel in ratings associated with gun turret operations. Additionally, the personnel assigned on battleships rated lower by several measures than those assigned to other ships.

The battleships, to include the *Iowa*, deployed with significant lower percentages of their authorized enlisted supervisors and turret-related journeymen. The other surface ships which we sampled deployed with an average of 101 percent of their authorization for supervisory enlisted personnel while the *Iowa* and the battleships deployed with 92 and 93 percent respectively.

These differences are more pronounced with respect to gunnersmates and fire control men. The impact of manning for gunnersmates aboard the *Iowa* was highlighted at the time of the explosion. In turret II, two of the three journeymen-level gun captain positions normally manned by E-5s were filled by E-4 apprentices. The center gun captain was the only journeyman gun captain at the time. All three of the gun captain positions in turret I were filled by E-4 apprentices.

We have been told repeatedly that the Navy has had difficulties in filling billets in battleships. Other surface ships that we sampled had excess gunnersmates and fire control at the journeyman and supervisory levels, primarily because personnel are promoted faster at these ships, or at higher rates. We were also told that personnel who were assigned to the battleships and who reenlist frequently request duty elsewhere to enhance their promotion opportunities. Similarly, they prefer to go to schools other than the 16-inch gunnery school so as to get training in more technologically advanced areas to advance their prospects for future promotion and civilian employment.

We found that battleship personnel fare worse in advancement opportunities. This is true for both officers and enlisted personnel. My prepared statement gives the percentages, the comparisons as between the battleships and the other ships that we sampled. The other surface ships that we sampled included destroyers, cruisers, and so on. I do not need to go into those comparisons right now.

Also, there is a higher rate of disciplinary actions among battleship personnel. For example, the battleships' nonjudicial punishment rate per 1,000 was approximately 25 percent higher than the ship sample rates. I might say that about 70 percent of the battleships' manning consists of personnel in grades E-1 through E-4. Battleships have a lower level of supervisory personnel than the ships in our sample. Navy officials agreed these factors probably have contributed to the higher disciplinary rates aboard the battleships.

Now a few words about training. The adequacy of training on the *Iowa* itself became an issue because the Navy's accident investigation report on the explosion said that unqualified personnel were manning the turret. However, the former commanding officer of the *Iowa* said the crew was trained, just that the records were not up-to-date. Since the training records for the deceased crew were destroyed in the explosion, never existed, or have never been located, we were unable to reconcile this conflict.

We found, however, that oversight inspections which should have assessed the *Iowa*'s personnel qualification standard program failed to do so during the 18 months preceding the explosion. Priorities were placed on other areas during the review, or the review team lacked the expertise to evaluate the 16-inch qualification program.

Also, weaknesses exist with the Navy's formal training program for 16-inch gun operations and maintenance. Our visits to the 16-inch school disclosed that limited hands-on training was being provided due to the lack of training aids. Training films being used at the school were basically 1940s vintage, and I might say that no improvements were noted as recently as 2 weeks ago by our staff in the structure or available training aids since the time of the explosion. While the Navy developed a draft training plan to improve the 16-inch training courses in September 1989, the plan still awaits final approval and implementation.

Finally, Mr. Chairman, in response to your request we reviewed the Navy's concept of battleship employment. While the battleships, of course, are very capable weapons platforms and have been included in deployment schedules and operational plans, emerging conditions limit their utility. The battleships were reactivated to alleviate existing force structure shortfalls and to help meet the 600-ship goal using existing platforms.

The battleships provide an imposing array of fire power. The Tomahawk missile gives them a significant capability for attacking both land and other surface ships. The Harpoon missiles also contribute to the battleship's capability, and the 16-inch guns are the best source of naval surface fire support for an amphibious assault.

Because of the imposing size and configuration, the Navy believes, also, a battleship's presence can be a strong deterrent in a third world scenario. While the battleship's Tomahawk and Harpoon missiles capability is imposing, I need to point out it is not unique within the Navy. Many other Navy vessels, submarines as well as surface ships, carry these same weapons, and the battleships' contribution to future amphibious warfare may be limited because of the distances of current scenarios versus the capability of the guns.

Furthermore, with only two battleships, personnel tempo restrictions will limit future deployments. Current policies, for example, preclude a ship from deploying for an additional 12 months after it returns from a 6-month deployment. Thus, with only two ships in the active force, it is unlikely one would be available on short notice should a crisis erupt. The battleships are also labor-intensive, requiring a crew of about 1,500, compared, for example, to a crew of about 360 on an Aegis cruiser.

Chairman NUNN. Do you have that broken down as to how many of that crew are related to using those big guns as opposed to the other parts of the crew? One of the main reasons for bringing those battleships back was not necessarily the guns. That was one reason, but also the cruise missile capability, to put on a platform that had a lot of survivability, more survivability than most Navy ships. Do you have a breakdown between the number of personnel required for the 16-inch guns versus the people required to run the ship if you did not have those guns at all?

Mr. CONAHAN. I do not have the number before me, but I think I can give it to you before this hearing is over. I think it is around 10 percent, Mr. Chairman.

Chairman NUNN. Only 10 percent relate to those guns?

Mr. CONAHAN. Something like that, but let me give you that number before the hearing is over.

[The information follows:]

At wartime manning levels, about 16 percent of the *Iowa's* crew man the 16-inch turrets and magazines.

Mr. **Conahan**. Finally, reducing the number of battleships to two, especially with one home-ported on each coast, will compound the manning and training problems that I discussed earlier and further limit availability.

In closing, Mr. Chairman, I do not have to remind anyone here of the budget situation that we are facing generally and the pressures to reduce the defense budget. That leads me to say that because the battleships are costly to maintain and difficult to man, and because of the unanswered safety supportability and mission-related questions, the two remaining battleships seem to be top candidates for deactivation as we look for ways to scale back U.S. forces.

That conclusion, that thought on our part, came out of the employment work that we did, sir.

[The prepared statement of Mr. Conahan follows:]

Statement Of
Frank C. Conahan
Assistant Comptroller General
National Security and International Affairs
Division

Mr. Chairman and members of the Committee:

I appear before the Committee today to discuss the results of our work concerning several issues pertaining to the April 19, 1989, explosion of the center gun in Turret II aboard the USS Iowa. The explosion killed 47 sailors. Since the Navy's September 1989 report on its investigation of the explosion, concern has been expressed on the adequacy of the investigation and the continued safety of battleships.

Our work was based on requests received from you; The Honorable Mary Rose Oakar, Chairwoman, Subcommittee on Economic Stabilization, House Committee on Banking, Finance and Urban Affairs; and the Honorable Howard M. Metzenbaum, United States Senate. We were asked to (1) conduct an independent investigation of the Navy's technical analysis of likely causes of the explosion, (2) review the safety aboard battleships, (3) examine manning and training issues raised by the Iowa's Commanding Officer after the explosion, and (4) review the battleships' employment plans and mission. We engaged the Department of Energy's Sandia National Laboratories to conduct a technical analysis and review the adequacy of the Navy's technical investigation. We addressed the other issues.

RESULTS IN BRIEF

Before discussing in detail our findings in each of the areas reviewed, let me briefly summarize.

Technical Analysis

Sandia's analysis could not corroborate the Navy's technical finding that an improvised chemical device initiated the explosion. Furthermore, Sandia has identified a potential hazard -- the impact sensitivity of the gunpowder in combination with an overram at higher than normal speeds which could have caused the explosion. Sandia believes that further testing on this is needed to confirm its finding.

Safety and Serviceability

As discussed in the Navy's report on the explosion and the subsequent Navy Inspector General's report on the gunpowder experimentation that was taking place at the time, safety policies and procedures were not being followed at the time of the explosion. Both Navy reports concluded, however, these violations did not cause the explosion. We examined various equipment, ammunition, and personnel safety records for the four battleships and did not find anything to lead us to believe that the battleships had experienced safety or material problems different than those experienced by other naval ships.

Manning and Training

We found that, as a result of the Navy's assignment process, the *Iowa* and the battleships were assigned a disproportionably low percentage of enlisted supervisory personnel, including gunners mates and fire controlmen, when compared to a selected sample of other ships. Also, we corroborated the *Iowa*'s former Commanding Officer's perception that the quality of manning on the battleships was lower than that for naval ships on average.

We also identified some specific training issues. However, because training records were destroyed in the explosion, we could not reconcile the conflicting statements from the former Commanding Officer that his personnel were adequately trained on the day of the explosion and the Navy's accident investigation report that said they were not.

Battleship Missions

The battleships, with their combination of weapons, provide an imposing array of firepower. They perform a strike mission with their cruise missiles and their 16-inch guns are the best source of naval surface fire support for an amphibious assault. Also, according to Navy officials, the battleships can be a strong deterrent in a third-world scenario. However, other ships with cruise missiles provide excellent strike warfare capability and the changing world security environment brings into question the Navy's need to maintain the battleships to support a large scale amphibious assault.

Moreover, the planned retirement of two battleships, including the Iowa, raises questions about the usefulness and supportability of the other two ships in the active fleet. A deployed battleship's presence in overseas theaters will be limited because of the effect of peacetime operating and personnel tempo restrictions on the two remaining battleships. Manning and training problems will also be compounded by a smaller pool of experienced 16-inch gun-related personnel.

It is inevitable that the defense budget will be reduced over the next several years. Given the unanswered safety-related questions, the manning situation, the mission-related questions, and the usefulness and supportability concerns, the two remaining battleships seem to be top candidates for decommissioning as we look for ways to scale back U.S. forces.

SANDIA'S REVIEW OF NAVY TECHNICAL FINDINGS

When we were asked to obtain technical assistance to review (1) the issue of evidence of foreign material in the rotating band of the projectile lodged in the gun barrel in which the explosion occurred, which the Navy interpreted as being from a detonating device, and (2) the stability of the gunpowder, we counseled with the National Science Foundation and the Office of Technology Assessment. Both stated that the Department of Energy's laboratories, especially Sandia National Laboratories, were capable sources of conducting an independent analysis.

At our request, Sandia performed an analysis concentrating on two areas. First, Sandia explored whether the Navy's finding of foreign material in the rotating band of the projectile lodged in the *Iowa*'s gun and the Navy's analysis of such material indicated that an improvised chemical detonator ignited the powder and caused the explosion. A major constraint to Sandia's analysis was that, after the Navy's and the FBI's analyses, there was no longer any part of the *Iowa*'s rotating band that had not been subjected to an analysis or examination. Furthermore, the Navy could no longer locate a significant piece of evidence-- the iron fibers with encrusted material that the Navy said came from a detonating device. However, Sandia was able to build upon the Navy's analysis and to obtain parts of the band to examine. It is confident in its findings, which conclude that the foreign materials that the Navy found were not inconsistent with the nominal levels found throughout gun turrets and were consistent with the maritime environment. For example, calcium and chlorine--two elements in the Navy's postulated detonator--were readily detectable in both Turrets I and II (the turret in which the explosion occurred) on the *Iowa* and in turrets on the battleships *New Jersey* and *Wisconsin*. Therefore, Sandia could not corroborate the Navy's finding that such foreign material was evidence of a detonator.

Second, Sandia explored whether the explosion could have been caused by an accidental ignition of the powder. Sandia agreed with the Navy accident investigation report that the powder was stable and confirmed that a significant overram of the powder charge occurred. However, Sandia has raised a question regarding the Navy's statement that impact and compression of the bag charge were not contributing factors to the Iowa incident.

Sandia believes that a possible alternate scenario to the Navy's finding of a deliberate act is that an unintentional high speed overram of the powder bags combined with the impact sensitivity of the powder led to the explosion. Suggestion of an unintentional high speed overram comes from (1) the Navy's accident investigation report which noted that the rammerman was conducting his first live firing and there were reports of an unidentified problem with the center gun immediately before the explosion and (2) Sandia's postulation that the car which brings the powder to the gun room had not returned, which it normally could have during the time of a normal speed ram. Sandia does not consider its study complete, in the sense that a clear and definite cause of the explosion has been identified, and it recommends areas of further investigation by the Navy.

The Executive Summary of Sandia's report is included as an appendix to this statement and its printed report will be available on June 4, 1990. Mr. Schwoebel, who directed Sandia's work, is with me today to discuss Sandia's analysis.

SAFETY AND SERVICEABILITY

According to the Navy's investigation report, approved procedures to ensure the safe firing of the 16-inch guns were not followed aboard the Iowa on April 19, 1989. Subsequently, the Navy Inspector General also concluded that the experimentation with gunpowder conducted aboard the Iowa was "at worst not safe and at best undetermined in its safety." To further investigate the safety and serviceability of battleships we reviewed reports of equipment problems, ammunition mishaps and malfunctions, and personnel-related injury data for all four battleships and compared them to Navy ships in general. This data disclosed no systemic problems with the material condition of the guns or the ammunition components involved in the explosion, or on the battleships, in general, that warrant any corrective action.

Safety Violations

The Navy's investigation of the explosion found that safety policies and procedures were not being followed. For example, although no spark producing items are allowed in the turrets, items such as cigarette lighters, rings and keys were found on the remains of the deceased sailors.

The Navy's investigation at the time of the explosion also believed that Iowa personnel had improperly approved and were conducting gunnery experiments. Ship personnel were loading an inappropriate projectile/powder combination when the explosion occurred. This involved 5 bags of an authorized type of powder with a 2,700-pound projectile rather than 6 bags of the authorized type of powder. Improperly authorized combinations were fired on at least two other occasions. The Navy believed that neither the presence of spark producing devices nor the experimental firing caused the explosion.

The Navy Inspector General subsequently investigated the reported experiments with 16-inch projectiles and propellant and concluded that the firings in question on the Iowa were, in fact, improperly authorized and contrary to Navy procedures. His report concluded that the safety hazard posed to the Iowa's crew by the experiments was, at best, undetermined.

No Prior Indications of Safety or Serviceability Problems

We reviewed reports of equipment problems, ammunition mishaps and malfunctions, and personnel-related injury data for all four battleships since their reactivation. For example, we examined the equipment failure reports that ships submit for all equipment failures that affect their ability to perform their mission and that cannot be corrected within 48 hours. All of the equipment failure reports the battleships submitted for equipment failures affecting the 16-inch turrets since their reactivation were categorized as having only a minor impact on the ships' primary missions. We also noted no trend or pattern in the reported equipment failures that indicated systemic problems with the guns and other turret equipment.

We also compared the battleships' equipment failure experience to that of other surface ships to determine if the battleships present any undue material or supply support problems. They do not appear to do so. Between 1984 and 1989, for example, the battleships operated without any major equipment failures for a substantially greater percentage of time than did surface combatants as a whole. There were no distinct differences in the percentages of the equipment failure reports submitted because the necessary repair parts were not available on the ships.

Previous Ammunition Mishaps/Malfunctions

We also examined several data sources, including ammunition mishap and malfunction reports and investigations. We found no indications of preexisting problems with the type of propellant involved in the explosion. However, ammunition problems have been encountered with other 16-inch ammunition components in the past. For example, there were problems with split powder bags. A program is underway to correct that problem. Other problems, which have been addressed, were encountered with earlier versions of the primers used to ignite the powder charges because the primers deteriorated in storage.

Susceptibility to Inadvertent Detonation

Concerns were raised after the explosion over the ammunition's sensitivity to the effects of electromagnetic radiation, frequently referred to as HERO. Communications and radar transmitters can transmit radiation that can cause ammunition components containing electrical circuits to detonate. The primer was the only ammunition component involved on April 19 that contains an electrical circuit and it requires only moderate protection from electromagnetic energy; it cannot be within 56 feet of a transmitting AN/WSC-3 antenna for example. Turret II is about 100 feet from that type of antenna, so HERO should not have been a concern. In their investigations, Sandia and the Navy ruled out the primer as the cause of the explosion.

While 16-inch ammunition components do not fully meet the Navy's criteria for insensitivity to unplanned heat, shock, or impact stimuli, the current inventory ranks 19th among the 25 munitions of greatest concern to the Navy. The ammunition does not meet the Navy's standards because it demonstrates some susceptibility to sympathetic detonation--detonating in response to a near-by detonation of another explosive item. The requirement to meet the standards has been waived for the current inventory, however, because the Navy considers that the 16-inch inventory poses a relatively low danger compared to other ship board munitions and because modifying other munitions has a higher funding priority.

Personnel Injury Experience

We also reviewed the reports of personal injuries and deaths occurring on board the battleships and compared the results to injury rates on all surface ships to determine if this would reveal any systemic gun or ammunition problems. They did not.

Any accident resulting in a fatality, a lost workday, an electrical shock, a person overboard, or a chemical or toxic exposure must be reported to the Navy Safety Center. We found that the injury rates for the battleships were lower than the rates of other ship types in 1987 and 1988. The battleships' 1989 rate was higher than that for surface ships overall, but it would have been lower if the Iowa explosion was excluded from the statistics. While the Iowa had the highest injury rate of the four battleships in 1989 (again, due to the turret explosion), its injury rate was not the highest among the four battleships in 1987 and 1988.

Other than the Iowa's turret explosion, none of the reported accidents aboard the battleships involved firing the 16-inch guns. One sailor, however, was injured in a turret during a training drill, and another was injured in a 16-inch magazine while conducting an operational test. Most of the accidents involved injuries such as toxic inhalation, contusions, and fractures incurred during routine operations. For example, sailors slipped and fell on decks and ladders, had hatches closed on their hands, or were injured handling heavy equipment or supplies. Additionally, none of the reported accidents involved electrical shocks in the 16-inch turrets.

MANNING

We found that battleships, in comparison to other surface ships were not assigned an equal share of authorized enlisted supervisory personnel or personnel in ratings associated with gun turret operations. Additionally, the personnel assigned on battleships rated lower by several measures than those assigned to other ships.

Low Manning Level of Supervisory Personnel

We compared peacetime authorizations to on-board manning for the battleships with the average of 17 surface ships at various times in the deployment cycle. We did not include the battleship Wisconsin because it had not deployed since its reactivation. The 17 surface ships included destroyers, cruisers, and amphibious assault type ships. We found that the overall percentage of authorized enlisted personnel assigned to the battleships was comparable to that of the sample ships. However, manning levels of all battleship enlisted supervisors, including gunners mates and fire controlmen associated with the 16-inch turrets were generally lower than those of the other ships in our sample.

The battleships and the Iowa deployed with significantly lower percentages of their authorized enlisted supervisors and turret-related journeymen. The ships in the sample deployed with an average of 101 percent of their authorization for supervisory enlisted personnel (pay grades E-7 through E-9), while the Iowa and battleships deployed with 92 and 93 percent, respectively. These differences were more pronounced for gunners mates and fire controlmen, as table 1 shows. The situation was similar with regard to journeymen (pay grades E-5 and E-6) in the gunners mate and fire controlman ratings.

Conversely, as the table shows, the battleships were assigned a higher percentage of their authorized apprentices in pay grades E-1 through E-4.

Table 1: On-board Percentages of Gunners Mates and Fire Controlmen Compared to Billets Authorized Levels at Deployment

	Iowa	Battleships	Ship Sample
	(percent)		
All Supervisors	92	93	101
Gunners Mates:			
Supervisors	73	77	100
Journeymen	88	82	135
Apprentices	94	92	73
Fire Controlmen:			
Supervisors	92	88	120
Journeymen	89	92	128
Apprentices	106	109	85

The impact of manning for gunners mates aboard the Iowa was highlighted at the time of the explosion. In Turret II, two of the three journeymen level gun captain positions, normally E-5s, were filled by E-4 apprentices. The center gun captain was the only journeyman gun captain. All three of the gun captain positions in Turret I were filled by E-4 apprentices and a journeyman was filling the supervisory turret captain's position, which is normally filled by an E-7.

Chief of Naval Personnel officials recently told us that they had difficulties in filling billets on battleships. The officials also said that the ship sample had excess gunners mates and fire controlmen at the journeymen and supervisory levels because their personnel were promoted at higher rates. Also, personnel promoted during a deployment are not reassigned, even though on-board excesses develop. Since the school terms for those ratings on the sample ships are longer than those for the 16-inch-related schools, the personnel tend to be a higher grade when reporting to ships of the types in our sample.

The officials also noted that personnel who are assigned to the battleships and who reenlist frequently request duty elsewhere to enhance their promotion opportunities by gaining practical experience in the more common gun weapon systems. Similarly, they prefer to attend schools for other gun weapons systems to enhance their promotion opportunities and, because the other guns have newer electronic technology to enhance their prospects for future civilian employment. Sailors aboard the Iowa expressed similar views to us.

Battleship Personnel Fare Worse In Advancement Opportunities

As of December 1989, battleship officers had been selected at a lower rate, compared to officers in the sample of other surface warfare ships for leadership positions such as executive officer and commanding officer. Only 23 percent of the commanders serving on battleships were considered qualified for commanding officer compared to 88 percent of the commanders on the sample ships. For lieutenant commanders be considered to serve as executive officers, the figures were more comparable -- 53 percent of battleship lieutenant commanders were considered qualified compared to 56 percent on the sample ships. However, the Iowa had only 25 percent considered qualified.

Battleship enlisted personnel also fared worse during the March 1989 promotion cycle than did personnel aboard other ships in our sample. Battleship personnel overall scored lower on the promotion tests, a key element in the promotion eligibility process. Gunners mates and fire controlmen failure rates for battleship and Navy-wide personnel were similar. However, the battleship gunners mates and fire controlmen failure rates of 11 and 6 percent, respectively, were significantly higher than the ship sample's failure rates of 0 and 1 percent, respectively.

Among those who passed the test, fewer battleship personnel in the gunners mate and fire controlmen ratings were selected for promotion. For example, 53 percent of the gunners mates on board the battleships was promoted compared to 65 percent for the ship sample and 58 percent Navy-wide. For fire controlmen, the results were 8 percent for the battleships, 15 percent for the ship sample, and 13 percent Navy-wide.

Higher Rate of Disciplinary Actions

During fiscal year 1989, battleship personnel experienced a higher rate of disciplinary actions, including non-judicial punishments (NJPs), courts-marital, and punitive discharges. For example, the battleships' NJP rate per thousand (195) was approximately 25 percent higher than the ship sample rate (158 per thousand) and 185 percent higher than the Navy-wide rate (69 per thousand). While the Iowa had the lowest rate (173 per thousand) among battleships, its NJP rate was still 150 percent higher than the Navy-wide rate. ~~Similar~~ results were noted for the battleships' and the Iowa's courts-martial and punitive discharge rates.

About 70 percent of the battleships' manning consists of personnel in grades E-1 through E-4. Battleships also have a lower level of supervisory personnel than the ships in our sample. Navy officials agreed these factors may have contributed to the higher disciplinary rates aboard the battleships.

PROBLEMS IN 16-INCH TRAINING

The adequacy of training on the Iowa became an issue because the Navy's accident investigation report on the explosion said that unqualified personnel were manning the turret. However, the former Commanding Officer of the Iowa said the crew was trained, just that the records were not up to date. Since the training records for the deceased crew were destroyed in the explosion, never existed, or have not been located, we are unable to reconcile this conflict. We found, however, that oversight inspections, which should have assessed the Iowa's 16-inch Personnel Qualification Standard (PQS) program, failed to do so during the 18 months preceding the explosion. Priorities were placed on other areas during the review or the review teams lacked the expertise to evaluate the 16-inch PQS program. Additionally, the Navy had not approved a training plan for the battleship class and the advanced training school had limited hands-on training aids for operation and maintenance instruction.

While the Iowa had a PQS program for the personnel assigned to its turrets, insufficient records were available after the explosion to provide an overview of the individuals' qualifications. The Navy's accident investigation report criticized the Iowa for a lack of documentation, especially service record entries, for determining the qualifications of assigned personnel. We found, however, that service record entries, while preferable, were not required until personnel were transferred to another command. The Iowa and its type commander's regulations now require such entries upon completion of assigned PQS tasks. Our review of service records for selected turret positions in November 1989 found the new requirements had been implemented.

Using reconstructed data, Iowa officials attempted to evaluate the qualifications status of the personnel assigned turret positions on April 19. Personnel were considered to be "operationally qualified" based on the number of gun fire exercises and training drills in which they had participated. While the information they developed indicated that the personnel assigned in the turret were experienced, we found weaknesses in the analysis. In our opinion, the crew's proficiency cannot be verified because the information merely shows that the crew members were assigned to a position within the turret during the exercises and drills but does not document that they actually performed the responsibilities. For example, one person was classified as operationally qualified, even though he was serving in his assigned role for the first time on April 19. In another case, the status of one individual serving in Turret II was not included in the analysis.

The Iowa's Turret II was authorized five personnel who are required to have completed training at the Navy's formal school for 16-inch gunners. However, on the day of the explosion, only two of the positions were filled with individuals who had attended the school.

Weaknesses exist with the Navy's formal training program for 16-inch gun operations and maintenance. Gunners mates aboard both the Iowa and the New Jersey were very disappointed with the Navy's formal school for 16-inch gunners because it lacked actual turret equipment and they believed it offered little practical instruction. The crews believed that they learned their jobs through on-the-job training. Likewise, both the school's internal evaluations and the Navy's draft training plan for the battleships noted the problems caused by the lack of training aids. Our visits to the school confirmed that limited hands-on training was being provided due to the lack of training aids. Training films being used at the school were basically 1940's vintage. No improvements were noted in the structure or available training aids since the explosion. While the Navy developed a draft training plan to improve the 16-inch training courses in September 1989, the plan still awaits final approval and implementation.

BATTLESHIP MISSIONS

In response to your request, we reviewed the Navy's concept of battleship employment-- what are the ships' wartime missions and how they are scheduled for peacetime deployment. My remarks will be brief since much of the detailed information is classified.

While the battleships are very capable weapons platforms and have been included in deployment schedules and operational plans, emerging circumstances limit their utility. The battleships were reactivated to alleviate existing force structure shortfalls and to help meet the 600-ship goal using existing platforms. The battleships, with their combination of 9 16-inch guns in 3 turrets, 8 5-inch twin gun mounts, 16 Harpoon antiship cruise missiles, and 32 Tomahawk cruise missiles, provide an imposing array of firepower. The Tomahawk missiles give them a significant capability for attacking land targets and other surface ships. The Harpoon missiles also contribute to the battleships' capability to operate against hostile surface ships. The battleships' 16-inch guns are the best source of naval surface fire support for an amphibious assault and are, in fact, the only guns larger than 5 inches remaining on Navy ships. When compared to air support in an amphibious operation, Navy officials said the 16-inch guns, within their range limitations, can deliver more firepower under a wider variety of weather conditions. Because of its imposing size and configuration, the Navy believes a battleship's presence can be a strong deterrent in a third-world scenario.

While the battleships' Tomahawk and Harpoon missile capability is imposing, it is not unique within the Navy. Many other Navy vessels, submarines as well as surface ships, carry those same weapons. Also, the battleships' contribution to future amphibious warfare also may be limited. The current maximum range of just over 23 miles of the battleships' 16-inch guns (their only unique weapon system) impairs the ships' ability to provide effective naval surface fire support within the context of an "over the horizon" amphibious assault--one launched from 25 to 50 miles offshore and extending far inland.

Furthermore, with only two battleships, operating and personnel tempo restrictions will limit future deployments. Current policies, for example, preclude a ship from deploying for an additional 12 months after it returns from a 6-month deployment. Thus, with only two ships in the active force, it is unlikely one would be available on short notice should a crisis erupt. The battleships are also labor intensive, requiring a crew of about 1,500 compared, for example, to a crew of about 360 on an Aegis cruiser. Finally, reducing the number of battleships to two, especially with one homeported on each coast, will compound the manning and training problems discussed earlier and further limit availability.

There is current pressure to greatly reduce the defense budget, which led to the decision to retire two battleships. Because the battleships are costly to maintain (about $58 million to operate annually according to the Navy), and difficult to man, and because of the unanswered safety and mission-related questions, they should be actively considered in budget trade-off decisions currently being explored by the Department of Defense.

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Mr. Chairman, that concludes my prepared remarks and I would be happy to answer any questions.

Executive Summary

This report describes work by Sandia National Laboratories (SNL) relevant to three aspects of the explosion that occurred in the center gun room of Turret 2 of the USS IOWA on April 19, 1989, killing 47 crewmen. Our studies began in December 1989 with initial contacts and information exchange with the United States Navy (USN). Technical work began in January 1990 and continued to May 15, 1990.

The essential results of our study are as follows:

(1) We could neither prove nor disprove the presence of a chemical ignitor proposed by the USN. The interpretation of evidence for a chemical ignitor is complicated by the fact that some chemical constituents of such an ignitor are found throughout 16 in. gun turrets, not only on the USS IOWA, but also the USS WISCONSIN and the USS NEW JERSEY. Forms of these constituents are either commonly used in the turrets or are a part of the maritime environment. Steel wool was another component of the proposed ignitor. We found iron fibers in the rotating band that could be steel wool, but we were unable to clearly identify a source of fibers of their diameter. We believe evidence for the presence of a chemical ignitor is inconclusive.

(2) Our analyses indicate that the propellant stabilizer was within acceptable limits. We also found only a very remote possibility that this propellant could be initiated in the breech by friction, electrostatic discharge, or electromagnetic radiation. Similarly, we conclude there is only a very remote possibility the black powder could have been initiated in the breech by any of these mechanisms. Ether/air combustion cannot be achieved because minimum necessary concentrations are precluded. Even if the minimum concentrations are achieved and combustion occurs, our analyses show that the propellant cannot be ignited. These findings are in general agreement with those of the USN.

(3) We confirmed that the powder bags were overrammed against the projectile and determined that the extent of the overram was approximately 3 in. greater than that established by the USN. Our analyses indicate that the bag charges were under a compressive load of at least 2800 pounds at the time of the explosion. There may have been even higher transient forces due to dynamic loading resulting from a greater than normal ram speed. While the rammer is capable of a speed of 13.9 ft/s, we could only establish that the rammer speed was at least 2 ft/s.

(4) The cause of the explosion was not conclusively determined. However, an important factor may have been the increase in impact sensitivity of a powder bag with a reduced number of pellets in its trim layer. (The trim layer is an incomplete layer of pellets lying on their sides in the front of the bag and just behind the black powder pouch on the next bag.) Our half-scale experiments indicate that reducing the number of these pellets lying next to the powder pouch increases impact sensitivity enough that an explosion could have been caused by an overram at a higher than normal speed. Our studies indicate that impact initiation depends on two key factors: the number of pellets in the trim layer, and the speed of the overram. However, these experiments must be extended to actual 16 in. gun conditions to establish the validity of this ignition mechanism.

Navy personnel were most helpful in providing information and materials germane to this study. In particular, we are grateful to Captain Joseph D. Miceli, USN, Director of the Technical Support Team, Naval Sea Systems Command, who responded without fail to a host of requests that grew out of our study. This included arranging for information gathering visits aboard the USS IOWA and two other battleships; extensive interactions with personnel at the Naval Surface Warfare Center (NSWC-Dahlgren), Dahlgren, VA; Naval Weapons Support Center (NWSC-Crane), Crane, IN; Naval Ordnance Station (NAVORDSTA), Indian Head, VA; Norfolk Naval Shipyard (NNSY), Norfolk, VA; Naval Ordnance Station (NAVORDSTA), Louisville, KY; and access to numerous reports and the testimony of several crewmen at the Judge Advocate General manual investigation. We are also indebted to the USN for arranging for us to speak with Gunner's Mate (Guns) First Class Dale E. Mortensen, who drew on his extensive experience to provide us with firsthand information regarding 16 in. gun operations.

The USN investigation of the accident was extensive and included a variety of studies that were conducted in considerable depth. Our studies drew heavily on that work. It served as a valuable basis on which to extend certain elements of this investigation, and made our studies more productive than they would otherwise have been.

Our studies focused on: 1) debris and any foreign materials in the rotating band of the projectile in the center gun; 2) their possible relation to or consistency with the hypothetical ignitor described by the USN; and 3) stability and sensitivity of the propellant and black powder contained in the individual bag charges used on the USS IOWA. The rotating band is located toward the rear of the projectile and, by engaging the rifling of the barrel, spins the projectile to ensure stability in flight.

Studies of debris from the rotating band had been performed by the USN and, to a much more limited extent, by the FBI. Evidence from the rotating band is considered potentially important because the cannelure of the band was exposed to the initial part of the explosion, and then closed as the projectile was propelled partway up the barrel of the gun. (The cannelure is a groove in the rotating band of the projectile.) That is, any foreign material found in the sealed cannelure region of the rotating band might contain important evidence regarding the initiation process. The stability and sensitivity of propellant is of interest because of its age at the time of the explosion (approximately 44 yrs) and the possibility of unforeseen effects of storage at elevated temperatures that occurred during part of the life of this material.

SNL personnel had access to an approximately 10 in. length of the USS IOWA rotating band. (The remaining approximately 40 in. of band had been consumed in experiments by the USN in its studies.) The 10 in. length of the band forwarded to us had originally been sectioned into several pieces and the cannelure opened and examined by the FBI. Accordingly, our studies are based on regions of the cannelure that had been opened, examined, and stored some months before.

The USN reported the presence of calcium (Ca), chlorine (Cl), polyethylene terephthalate (PET) film fragments, certain glycols and iron fibers in the rotating band of the projectile. The USN reported that these were foreign materials and evidence for the presence of an ignitor device composed of steel wool, brake fluid, and an oxidizing chemical (calcium hypochlorite), placed in a plastic bag.

We find that Ca and Cl are readily detectable throughout the entire region of both Turret 1 and Turret 2 of the USS IOWA, Turret 2 of the USS NEW JERSEY, and Turret 2 of the USS WISCONSIN. The presence of these elements is consistent with the maritime environment and the cleaning operations carried out in the turrets. We found these elements on two iron fibers that we extracted from the rotating band from the USS IOWA. We also observed an additional four small iron-fiber fragments that could not be removed from the rotating band for analysis without destroying them. The surfaces of three of these iron-fiber fragments had concentrations of Ca and Cl that were similar to the two that were extracted. (The fourth fiber was retained for another analytical procedure.) The occurrence of these elements on the various fibers does not clearly establish the presence of an ignitor device because the concentrations of these elements are within the statistical variation of Ca and Cl levels on metal fibers found elsewhere in the turret.

The USN had previously removed and analyzed several iron fibers from the USS IOWA rotating band. One of these fibers was described in the NWSC-Crane report to have crusted regions containing high concentrations of Ca and Cl. It was the analysis of this fiber that was the basis of the USN's assertion that iron fibers with abnormally high concentrations of Ca and Cl were found in the rotating band of the projectile of the USS IOWA. When we visited NWSC-Crane to examine this fiber, we found that it, along with some others, could not be located. SNL personnel worked jointly with NWSC-Crane to examine and analyze several other fibers that were retained by NWSC-Crane. All of those fibers were free of crusted regions, as were the six fibers we had previously either extracted or observed in the rotating band at SNL.

The surface concentrations of Ca and Cl on all the fiber samples that we have analyzed, both at SNL and jointly with USN personnel at NWSC-Crane, were of nominal levels, not greatly different from levels of these elements on fibers found in other turret locations. In fact, the concentrations of Ca and Cl observed by both ourselves and the USN were very similar, i.e., only small quantities of Ca and Cl were measured. We could not clearly identify any of the fibers that we extracted as remnants of steel wool. However, these fibers were found to have low (<0.6 at. %) bulk carbon concentrations consistent with steel wool, which is commonly made of iron fibers.

The USN also reported steel wool in the rotating bands of other projectiles stored aboard the USS IOWA. Those fibers could not be located so we were unable to analyze their surface composition. We identified some steel fragments in a brush used to clean the guns in Turret 2, but our analyses indicate that those high-carbon steel fragments came from bore liners inside the barrels. (A bore liner is the inner surface of the gun barrel and in direct contact with the projectile.)

The diameters of fibers found in the USS IOWA rotating band by both the USN and SNL were very similar. The USN states that the fibers found on other projectiles stored aboard the USS IOWA were of smaller diameter. We have not corroborated that observation because those fibers could not be located.

Two glycols in the rotating band of the projectile were identified by the USN as "significant foreign materials," possibly constituents of brake fluid used in the hypothetical ignitor device. Our studies show that the first of these glycols is a constituent of a cleaning and lubricating fluid (Break-Free™) routinely used in the turrets. Our analyses indicate that the USN identification of the second material as a glycol is incorrect. The material is actually phenol, which is also a constituent of Break-Free™. A third glycol, not considered to be a "significant foreign material," was identified by the USN as a constituent of a marker pen. We agree with that identification, but we find that it is also a constituent of Break-Free™.

The USN found a single fragment of a polymer film in the cannelure and identified it as a possible residue of PET. The USN proposed that a plastic bag of this material was used to contain the hypothetical ignitor device. We also identified fragments of this material in the brush used to clean the guns in Turret 2. PET is known to be chemically equivalent to Dacron™ and Mylar™. Accordingly, such fragments could have come from several sources, including the bore socks used for gun cleaning and ordinary clothing. We observed the presence of many polymeric species in the cannelure of the rotating band, but not PET. Because polymeric fragments can be found in various regions of the turret, their occurrence is not a unique indication of the presence of the hypothetical ignitor device.

SNL personnel also examined cannelure debris from a test at NSWC-Dahlgren in which the bag charges were ignited by a chemical ignitor similar to the one proposed by the USN. This ignitor used steel wool, but we found no iron fibers or fragments of iron fibers in the limited length (~8 in.) of the rotating band that we examined. The USN found five fibers in the entire band (~50 in.) from another test of this same kind. Apparently there can be considerable variation in the quantity and distribution of fibers from such experiments.

The USN provided us with twelve bags of propellant with black powder pads from the same lot as that aboard the USS IOWA at the time of the explosion. In addition, the USN provided access to its extensive studies and background information on this propellant and black powder.

The propellant used in the bag charges for the 16 in. guns contains a stabilizer (DPA) that scavenges decomposition products that are oxides of nitrogen. The stabilizer helps maintain uniform performance of the propellant over time. The USN stated that the level of stabilizer in the propellant aboard the USS IOWA was within specification. We also find that the average level of stabilizer is near the level reported by the USN. There is a small change in propellant sensitivity over the range of stabilizer concentration that we measured in pellets from the USS IOWA bag charges. We have not yet completed our investigation of the significance, if any, of this change.

The manufacture of propellant involves the dissolution of nitrocellulose in a mixture of ether and alcohol. Some ether remains in the propellant and evaporates over an extended period of time, suggesting a potential fire hazard. Our analysis shows that the probability of initiating an explosion by ether/air burning in the breech is so remote as to be practically impossible. Calculations show that the maximum temperature increase of the propellant that could occur in the burning of an optimum mixture of ether/air is only 30°C to 40°C. Initiation of the propellant requires a temperature increase of at least 170°C. However, the thermal ignition of finely crushed black powder by ether/air combustion remains an unresolved issue requiring additional study. Our studies also indicate that it is virtually impossible to initiate the propellant or black powder in the breech by electrostatic discharge, friction, or electromagnetic radiation at levels found within the turret.

An interior ballistics model was developed for the open-breech explosion. The model involves the high-speed flow of both hot propellant gases and pellets from the open breech. The model was used to calculate the time variation of pressure at the base of the projectile depending on the point of initiation along the five powder bags. It predicts with some accuracy the movement of the projectile up the barrel following the explosion. Our results indicate that the initiation site was most likely between the first and second bag charge, which agrees with conclusions reached by the USN in its field tests.

The USN reports that the propellant bags were overrammed into the breech of the center gun of Turret 2 by a distance of approximately 21 in. The USN interpretation was based in part on an analysis which assumed that parts of the rammerhead gouged the spanning tray. In our analysis we show that the gouges were caused by the rammer chain. Using this analysis, we found that the overram was more nearly 24 in. That is, the rammer moved approximately 24 in. beyond the point it would normally reach in placing the bag charges in the breech of the gun. Therefore, a significant overram and compression of the powder bags occurred.

The USN reports that "impact and compression (of the bag charges) were not contributing factors in the IOWA incident." Our results regarding the impact sensitivity of the propellant raise the possibility that initiation occurred by impact. Our one-half-scale (8 in.) experiments indicate that the fracture of propellant pellets lying transverse in the trim layer at the forward end of the bag can lead to initiation of the powder train. Initiation apparently occurs when the fractured pellets in the trim layer release burning particles from the fractured surfaces, igniting the black powder pouch of the adjacent bag. Ignition of the black powder then rapidly propagates the ignition throughout the rest of the powder train. Therefore, the ignition process involves the trim-layer pellets of one bag and the adjacent black powder pouch of the next (forward) bag.

We believe the probability of this initiation process depends on two key factors: 1) the number of trim pellets in the forward-most layer and 2) rammer speed. If there are a reduced number of trim pellets and the rammer is operated at higher speeds, the initiation process during an overram becomes more probable. For example, if there are twenty pellets in the trim layer, we estimate there is a probability ranging from approximately one in two to one in three that the propellant can be initiated at energy levels attainable when the rammer is operated at 13.9-ft/s, its maximum speed. However, propellant initiation by impact is a complex phenomena and much more work needs to be done to verify this estimate, particularly in actual 16 in. guns or systems that closely duplicate the 16 in. gun.

During a number of inspections in conjunction with USN personnel, we found that the powder hoist, powder door, rammer, and other mechanisms in the gun room appeared to be in proper operating condition at the time of the explosion. We concur with the USN that mechanical operations appear to have been normal and not associated with the explosion.

As established by the USN investigation, the door to the powder hoist was closed and locked, but the powder car had not been lowered at the time of the explosion. Immediate lowering of the car on closure of the powder door is the standard procedure. This suggests to us that the ramming occurred soon after the closing of the powder door and took place at high speed. That is, if a slow ram of 1 to 2 ft/s had occurred followed by 15 or 20 s of sustained overram as proposed by the USN, the upper powder hoist operator would have had approximately 20 to 25 s to begin lowering the powder car. However, if a high-speed ram occurred, there would have been little opportunity for the upper powder hoist operator to begin lowering the powder car. A high-speed overram seems consistent with these considerations.

A factor that may have contributed to the overram was an undefined problem in the loading operation. This undefined problem, reported through the ship's phone system by a member of the gun crew, led to a delay in loading the center gun relative to both the left and right guns in Turret 2. This undefined problem and delay could have created confusion during the powder-loading phase.

We conclude that a plausible cause of the explosion aboard the USS IOWA was a higher-than-normal speed overram of the bag charges into the rear of the projectile, initiating one of the forward bag charges that contained a reduced number of pellets in the trim layer. The fact that the bags were moved to a position substantially beyond the normal location is evidence supporting a higher-than-normal speed overram.

Our experiments of initiation by impact are incomplete and more work needs to be done on larger assemblies of pellets than we were able to accomplish in the short time available. Nevertheless, it appears from our present models that the probability of initiation of an explosion by impact is such that measures should be taken to insure that overrams do not occur at any speed.

These studies of the explosion aboard the USS IOWA represent a brief but concerted effort by SNL personnel to supplement the USN's investigation. Our starting point was the extensive work by the USN, and those studies were helpful in several phases of our study.

We do not consider this study to be complete in the sense that a clear and definitive cause of this explosion has been identified. There are several open issues that should be further explored, and the Recommendations section of this report lists areas we believe warrant further investigation.

Chairman Nunn. Thank you, Mr. Conahan. Is Mr. Ferber going to have anything to say at this point?

Mr. Conahan. No. He will answer questions as they come up.

Chairman Nunn. I suggest to members of the committee we go ahead and hear from our next witness and then come back and ask questions to both of them, including Mr. Cooper and Dr. Schuler. So Dr. Schwoebel, we will hear from you next.

STATEMENT OF DR. RICHARD L. SCHWOEBEL, DIRECTOR, COMPONENTS, SANDIA NATIONAL LABORATORIES, ACCOMPANIED BY DR. KARL W. SCHULER, DISTINGUISHED MEMBER OF THE TECHNICAL STAFF, SANDIA NATIONAL LABORATORIES; PAUL W. COOPER, DISTINGUISHED MEMBER OF THE TECHNICAL STAFF, SANDIA NATIONAL LABORATORIES; AND DR. JAMES A. BORDERS, TECHNICAL SUPERVISOR, SANDIA NATIONAL LABORATORIES

Dr. Schwoebel. Mr. Chairman and members of the committee, as you heard, seated with me are Mr. Paul Cooper and Dr. Karl Schuler of Sandia. Their contributions and important factors in Sandia's study of the explosion on the U.S.S. *Iowa* gave rise at least in part to the experiments at Dahlgren. One of those experiments yesterday is germane to the discussion today, and they can provide some insight to that experiment later on.

Our intent today is to go ahead with the presentation as we had originally planned it. It represents, I think, a real background for what has taken place, including yesterday. We agreed that the questions that you raise are not settled wholly in the scientific and technical sense. A lot more work needs to be done, and Sandia is very happy to continue to work with the Navy to help resolve this issue. We have had excellent relations with the technical team of the Navy, very open, candid, and they have been extremely helpful to us in every possible way.

I am not going to present a statement about Sandia. That is contained in your handout. I would simply suggest that that be included in the record for the day.

- **Introduction**
- **Foreign Materials**
- **Propellants**
- **Overram Analysis**
- **Impact Initiation of Propellant**
- **Recommendations**

The outline of my presentation is shown on the visual to your left. At the end of each of those major topic areas, the four central topic areas there, I will present one of the four conclusions of our work to that point. The visuals are also contained in your handout, and I think that they are in the proper order or within one or two of that.

Focus of the Sandia Studies

- **Foreign material in the rotating band of the projectile from the USS Iowa**
- **The possible relation of this foreign material to the hypothetical ignitor described by the USN**
- **Stability and sensitivity of the propellant and black powder in the bag charges used on the USS Iowa**

This visual shows the focus of the Sandia studies, and these are, as you can see, a prescribed list of things that we were asked to review. The first of these relates to the foreign material that was pointed out by the Navy from their perspective that was in the rotating band of the projectile from the U.S.S. *Iowa.*

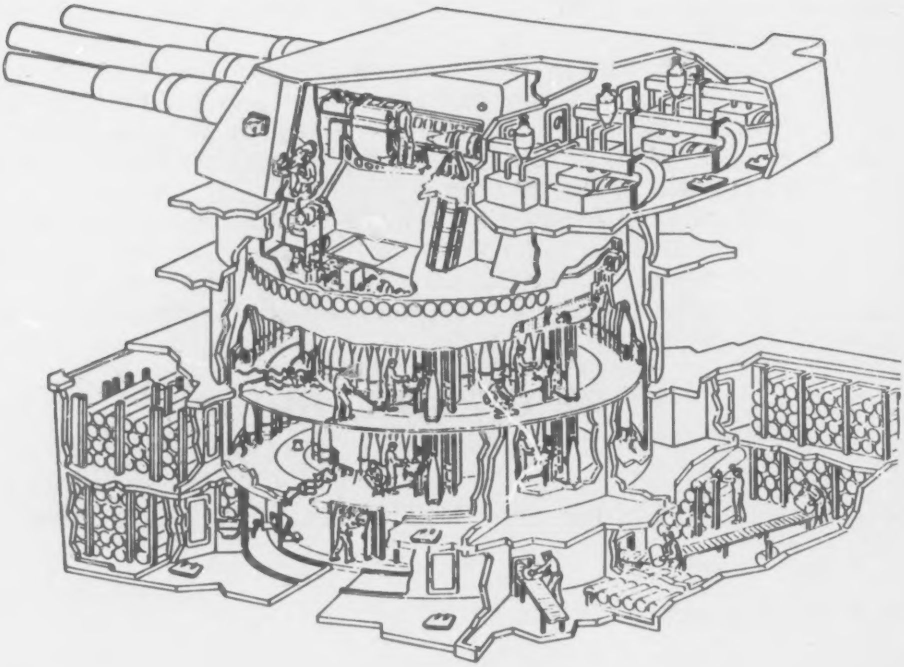
The second part of our work is related to the possible relation of this foreign material to the hypothetical or proposed chemical igniter that was described by the Navy.

The third is the stability and sensitivity of the propellant and black powder in the bag charges used on the U.S.S. *Iowa*; how we would reevaluate those factors from our perspective.

Now the first topic that I am going to deal with is one that is concerned with the foreign materials as they were referred to by the Navy. There are four important subtopics.

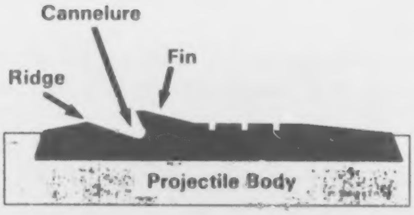
To orient you again to bring us up to date, let me mention first two visuals that will take us back into the actual gun situation.

16 in. GUN TURRET

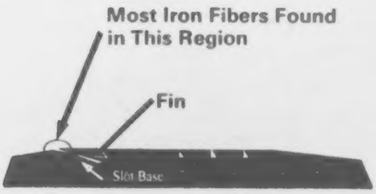


The first of these is a cutaway view of the turret in which we see, starting from the bottom, the magazines, the powder flats, moving upward the projectile decks, the equipment decks and the gunroom area. Of course, it is in the gunroom that the explosion occurred.

ROTATING BAND NOMENCLATURE USED IN MATERIALS ANALYSIS



Rotating Band Cross Section as Loaded



Rotating Band Cross Section as Recovered

The second of these two orientation viewgraphs is a cross-sectional view of the rotating band. As you will recall, the rotating band is a circumferential band that goes around the rear of the projectile and engages the rifling and is used to spin up the projectile to provide stability.

You will notice that in that rotating band in the figure on the left there is an open region, the cannelure, and as the projectile moves through the barrel that cannelure region is folded over in such a way that it partially seals off foreign material that may have been trapped in the cannelure.

In the case of the projectile aboard the U.S.S. *Iowa*, the projectile moved up the barrel in this open breach explosion about 40 inches, so that that cannelure was in part sealed. The idea, then, is to examine that region for any foreign materials that may bear on the cause of the explosion.

FOREIGN MATERIALS

- **Calcium and chlorine → (HTH - Calcium Hypochlorite)**
- **Two glycols → (brake fluid)**
- **Steel wool**
- **Polyethylene terephthalate (PET) film → (container)**

The first topic that I am going to discuss deals with these foreign materials. If we take a look at those, we will see that basically there are these four things that are involved. The first of these is the calcium and chlorine detected by the Navy and associated by them with the presence of HTH, a swimming pool cleaner or chemical, one constituent of the proposed chemical igniter.

The second major constituent was two glycols identified by the Navy and related by them to brake fluid, the second major component of the initiator.

The third component, steel wool, is something that can fuel this interaction and make it take place at a higher rate and with more intensity, increasing the surface area.

The fourth is the presence of a polymer film, a fragment of polymer film which they proposed was associated with a way to contain and then open by an intentional overram the proposed initiator.

I am briefly going to discuss each of the four elements of this rather complex topic.

Ca AND Cl BACKGROUND IN USS IOWA CLASS BATTLESHIPS

Location	Ca	Cl
Magazine	Y	Y
Powder Flat	Y	Y
Projectile Deck	Y	Y
Gun Room	Y	Y
Rotating Bands	Y	Y
USS Iowa Incident Rotating Band	Y	Y

(Y = Yes, Present; N = Not Detected)

The first of these discussions relates to the presence of calcium and chlorine within these battleships. This visual depicts a survey of the presence of these two elements in turret I of the U.S.S. *Iowa*; that is, the forward turret. We took approximately 50 or 60 samples throughout that turret. Note that calcium and chlorine are readily detectable everywhere throughout the turret and could arise from a number of sources. For example, seawater is a potent source of both chlorine and calcium. The fluids that are used to maintain the guns contain calcium, chlorine, barium and a number of other species. Also cleaning agents will contain some of these materials.

So the existence of calcium and chlorine in the rotating band is not in itself a fingerprint of the presence of HTH in the igniter that was proposed by the Navy.

The real question, then, is how much calcium and chlorine were present in the band, and do these quantities significantly depart from the concentration of these elements that you may normally see elsewhere in the turret?

Our report goes into this aspect in some detail, too much detail to really capture here in a short presentation. We find that with one exception our and the Navy's concentration measurements of calcium and chlorine are quite comparable.

We find the presence of calcium and chlorine is to be expected in this maritime environment and with the cleaning materials that are used. We find that the concentrations of calcium and chlorine on fibers in the U.S.S. *Iowa* rotating band appear not to be markedly different from fibers from other parts of the turret. Fibers from the band are not unique in calcium and chlorine concentrations.

GLYCOLS

- **Glycol #1**
- **Glycol #2**
- **Glycol #3**

Sandia result:

These materials are all constituents of the fluid routinely used to clean and lubricate 16" guns

Part two of the foreign materials section deals with the glycols——

Chairman NUNN. Dr. Schwoebel, if I may ask you a question right there so we can understand this. As you go along, if you can tell us where you may not be in complete agreement with the Navy's findings, particularly on the first section. Could you do that for us?

Dr. SCHWOEBEL. Yes, I certainly will.

The second section deals with the glycols.

Chairman NUNN. Now on the first section, was there any point of fundamental disagreement?

Dr. SCHWOEBEL. There is one point of disagreement in terms of one of the samples, or one kind of sample, and the measurement of the calcium concentrations. I will come back to that in a moment.

Chairman NUNN. All right, fine.

Dr. SCHWOEBEL. In the area dealing with the presence of glycols, the Navy pointed out the presence of glycols. I have just listed them as numbers one, two and three. In our studies we find that glycol number two is not actually a glycol. It is actually a phenol.

In any case, each of those three species, number one, number two and number three, are all constituents of the fluid that is routinely used to clean and lubricate these 16-inch guns. So in other words, these materials are normally present in the guns as constituents of the fluid used to maintain the gun. These glycols, then, are not foreign materials but are altogether expected materials. This connection between the glycols and the presence in the fluid used to maintain these guns was not made before our investigation.

IRON FIBERS

- **Sandia identified six fibers and the USN identified 30 fibers in different sections of the USS Iowa rotating band.**
- **The concentrations of calcium and chlorine determined by Sandia and the USN on USS Iowa and field test fibers are very similar - with one exception.**
- **That exception is a fiber (s) from the USS Iowa described by the USN to have "crusted" regions of high calcium. Sandia was not able to analyze that fiber(s) because it could not be located.**
- **Iron fibers found on other projectiles stored on the USS Iowa were reported by the USN to be of smaller diameter than those in the rotating band. Those fibers also cannot be located. Sandia has not identified an obvious source for fibers of such diameter.**

The third part of our work deals with iron fibers. Again, I have tried to summarize some important points in this single visual. Again I would point out that this is a very complex topic that cannot be simply conveyed in a few moments. It is dealt with extensively in our report.

First, I would like you to note up at the top that we identified six fibers, and the Navy identified 30 fibers in different sections of the U.S.S. *Iowa* rotating band. Now these fibers are on the order of 2.5 thousandths of an inch in diameter, and if you take the lengths and add them all up you have on the order of maybe an inch or so of material. So we are dealing truly with microscopic material. I think it is very important to understand that.

The second feature is that the concentrations of calcium and chlorine determined by Sandia and the Navy on the U.S.S. *Iowa* band and also field test fibers are very similar with one exception. That exception is a fiber or a few fibers from the U.S.S. *Iowa* that were described by the Navy to have crusted regions of high calcium. Sandia was not able to analyze that fiber or fibers because it or they could not be located. Now we understand that within the last few days the Navy has located these fibers, so I presume that we may be able to examine them at some time in the future.

Last, iron fibers found on other projectiles stored on the U.S.S. *Iowa* were reported by the Navy to be of a smaller diameter than those in the rotating band; that is to say, in the Navy survey they did find steel wool-like fibers on other projectiles aboard the U.S.S. *Iowa*, and they made the distinction that those fibers were of a different diameter. They were of a smaller diameter than fibers found in the rotating band of the U.S.S. *Iowa*. These smaller fibers also cannot be located at this time.

Sandia has not identified an obvious source for fibers of the larger diameter that were found in the U.S.S. *Iowa* rotating band. No obvious source.

Chairman NUNN. When you say they could not be located, does that mean the Navy has not stored those or does not know where they have stored them? What is your understanding of that?

Dr. SCHWOEBEL. Part of my emphasis in pointing out that these are microscopic materials is that since they are very small, these fibers could be in a very well-constrained area, but it may take some effort and time to go back and search through the whole set of sample supports, for example, and find that particular item again.

As I said, I think that in the case of the crusted fibers, that clearly was the case. They have now relocated those.

So we have not identified a source for the larger fiber. I would point out, however, that steel wool was, we understand, used in cleaning the turret after the explosion and before the projectile was removed. So we are still exploring the use of steel wool during the cleanup operation as a possible source of contamination.

Chairman NUNN. Dr. Schwoebel, let me just ask you this question. I do not know what is routine here and what is unusual. If Sandia had conducted the investigation, when you got through with important fibers, would you have a way of storing them where you could retrieve them?

Dr. SCHWOEBEL. I think that we would obviously work very hard to maintain crucial evidence of that sort.

Chairman NUNN. So if somebody came to you after you had completed an investigation and said where are the fibers, would you expect your people to be able to locate them?

Dr. SCHWOEBEL. I would expect them to be able to locate them.

Chairman NUNN. What would be your reaction if they could not locate them?

Dr. SCHWOEBEL. That would be disconcerting to me.

POLYMER FILM (PET) FIBERS

- **Sandia has identified PET fibers in the brush used to clean the guns in Turret 2.**
- **PET is the polymer from which Mylar™ and Dacron™ are manufactured.**
- **Sources of PET fibers include the Dacron™ bore socks used in gun cleaning and also clothing.**

The last part, the fourth part of the foreign materials area, deals with the polymer films, the PET. Sandia identified PET fibers in the brush that was used to clean the guns of turret II. It is important to recognize that PET is the polymer from which Mylar is made as the film, or Dacron is made as the fiber. And sources of PET fibers that are normal to the gun environment include, for example, the Dacron cloth, the bore sock, that is actually used to clean the gun.

This, I think, is very significant. That is, there are normal sources of PET that exist in the turret. In fact, we found definitive evidence of PET fragments that we could relate directly to the bore sock that is used to clean the gun.

Chairman NUNN. Now tell me again how this differs from what the Navy had before you got into this?

Dr. SCHWOEBEL. There was no mention of other sources of this sort of fiber in the turret.

Chairman NUNN. So the Navy had not mentioned other possible sources?

Dr. SCHWOEBEL. That is right.

Chairman NUNN. And they had labeled this foreign material?

Dr. SCHWOEBEL. That is correct.

Now, again, I would point out that the Navy's investigation was very broad in scope, and it covered many, many different topics, much broader than anything that we did.

Chairman NUNN. Right.

Dr. SCHWOEBEL. Our study was rather circumscribed, and so we were able to probe these areas in great detail.

Chairman NUNN. But, of course, this foreign material became a very crucial part of the Navy's finding in the final analysis?

Dr. SCHWOEBEL. Correct.

We could neither prove nor disprove the presence of a chemical ignitor proposed by the USN.

The interpretation of evidence for a chemical ignitor is complicated by the fact that some chemical constituents of such an ignitor are found throughout 16" gun turrets, not only on the USS Iowa, but also the USS Wisconsin and the USS New Jersey. Forms of these constituents are either commonly used in the turrets or are a part of the maritime environment.

Steel wool was another component of the proposed ignitor. We found iron fibers in the rotating band that could be steel wool, but we were unable to clearly identify a source of fibers of their diameter.

We believe evidence for the presence of a chemical ignitor is inconclusive.

So our first conclusion is, as indicated in the next visual, can neither prove nor disprove the presence of a chemical igniter proposed by the Navy. Prove or disprove in the scientific sense, now, is what I am saying. The interpretation of evidence for a chemical igniter is complicated by the fact that some chemical constituents of such an igniter are found throughout 16-inch gun turrets, not only on the U.S.S. *Iowa*, but we also did sampling aboard the *Wisconsin* and the *New Jersey*. Forms of the constituents are either commonly used in the turrets or are a part of the maritime environment.

Steel wool was another component of the proposed igniter. We found iron fibers in the rotating band that could be steel wool, but we were unable to clearly identify a source of fibers of their diameter. So that is the single species we could not make an obvious connection to a normal source.

We believe evidence for the presence of a chemical igniter is inconclusive.

Chairman NUNN. Now, let me ask on that point, because I guess that is one of the key findings you made here. If you had access to the other fibers that are not now available to you that we have just enumerated, could that make any difference in your conclusion here?

Dr. SCHWOEBEL. It could. We would have to examine those and understand what is the constituency of those and put those in context with the rest of our observations.

Chairman NUNN. How important were those missing fibers in the Navy's determination that there was unexplained foreign material present?

Dr. SCHWOEBEL. Well, we would like to make that comparison, because that really is a departure from what we have seen. We would like to see these fibers with the high calcium content.

Chairman NUNN. Was that a key part of the Navy's finding, that foreign material——

Dr. SCHWOEBEL. It was important to them, yes. And it is set out in their discussion as an important feature. That is correct.

> **Our analyses indicate that the propellant stabilizer was within acceptable limits.**
>
> **We also found only a very remote possibility that this propellant could be initiated in the breech by friction, electrostatic discharge, or electromagnetic radiation. Similarly, we conclude there is only a very remote possibility the black powder could have been initiated in the breech by any of these mechanisms. Ether/air combustion cannot be achieved because minimum necessary concentrations are precluded. Even if the minimum concentrations are achieved and combustion occurs, our analyses show that the propellant cannot be ignited.**
>
> **These findings are in general agreement with those of the USN.**

The second topic that I am going to discuss deals with the studies of the propellant and the black powder in the bag charges. Our findings here very closely parallel the results of the Navy. And because of that, I am going to go directly to the summary conclusion here, and then just pass on to another topic.

Chairman NUNN. Before we leave that last chart, if you could put it back up there, just so we get this as we go along, because it is complicated. Your finding is we believe evidence for the presence of a chemical igniter is inconclusive. Tell us in your own words how that differs from the Navy's finding.

Dr. SCHWOEBEL. Well, I think that our findings are that—and I hesitate to speak for the Navy, but our findings are that if—for example, if the initiator were present, and we looked at the kinds of backgrounds that we would find, we would expect to find calcium and chlorine and the glycols and so on.

On the other hand, if the igniter were not present, we would also expect to find calcium, chlorine, and glycols. So that, in a scientific sense, we can neither prove nor disprove that an igniter was present.

Chairman NUNN. Right. But you understand what the Navy found. Tell us what your understanding is of what they found.

Dr. SCHWOEBEL. My understanding is that they felt that there was a very high probability of a chemical igniter being included in the system at the time of the explosion, and that they considered their evidence to be very strong. That is my understanding.

Chairman NUNN. And you do not agree with that?

Dr. SCHWOEBEL. No, we do not agree with that.

Chairman NUNN. What they found to be strong evidence you found to be inconclusive?

Dr. SCHWOEBEL. That is correct.

Senator COHEN. Mr. Chairman, may I ask a question?

Chairman NUNN. Yes.

Senator COHEN. Is the steel wool something that is used to clean and scrub the turrets?

Dr. SCHWOEBEL. That is a question that——

Senator COHEN. Could you explain what the significance of the presence or absence of steel wool is?

Dr. SCHWOEBEL. Senator Cohen, that is a question that we have frequently asked. We understand that steel wool is not an authorized cleaning material. Whether it is in fact used is unknown to us. We cannot tell.

Senator COHEN. So the implication is that if steel wool were in fact found then that would be evidence that something had been placed there as part of an ignition or igniter?

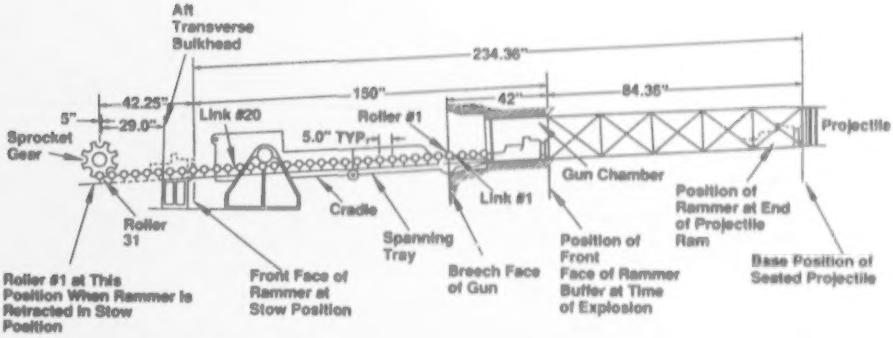
Dr. SCHWOEBEL. It would depend on comparing the kind of steel wool that was used, for example, in cleanup operations, to what has been observed in the bands. You would have to look at the details.

Senator COHEN. Thank you, Mr. Chairman.

Chairman NUNN. Thank you.

Dr. SCHWOEBEL. Now the third topic is the overram analysis.

OVERRAM SITUATION AT TIME OF IGNITION

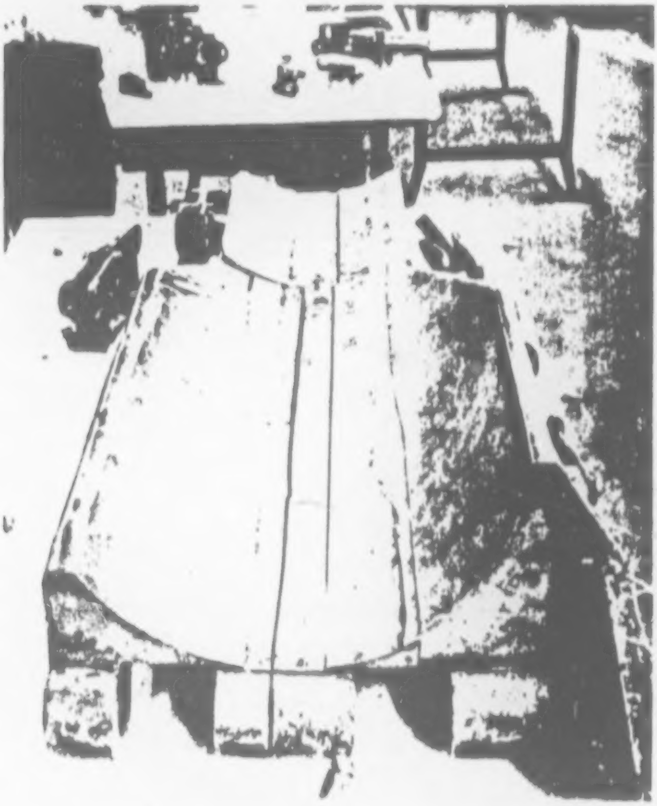

Aft Transverse Bulkhead
234.36"
150"
42"
84.36"
42.25"
5"
29.0"
Sprocket Gear
Link #20
Roller #1
5.0" TYP.
Projectile
Gun Chamber
Link #1
Cradle
Roller 31
Spanning Tray
Position of Rammer at End of Projectile Ram
Base Position of Seated Projectile
Roller #1 at This Position When Rammer Is Retracted In Stow Position
Front Face of Rammer at Stow Position
Breech Face of Gun
Position of Front Face of Rammer Buffer at Time of Explosion

What we put up here is a schematic of the rammer. The rammer, as I think you will recall, consists of a rather heavy rammer head, weighing 150 pounds or so, a massive chain, and a hydraulic drive that is controlled by the rammerman with a hand lever that operates like an accelerator or a throttle.

The rammer is used both to seat the projectile, which weighs, in this case, 2,700 pounds, and the powder bags, which, in this case, weigh about 500 pounds. The Navy determined that an overram occurred in loading of the powder. That is, the rammer pushed the powder about 21 inches too far into the breech. Their analysis was based on discoloration of the chain and sprocket and some other things that were associated with the explosion and fire.

The Sandia analysis of overram was based on a review of how the chain links of the rammer, those chain links that you see there, how they were blown out backward in the explosion, and how they gouged the spanning tray that is used to guide powder bags into the breech.

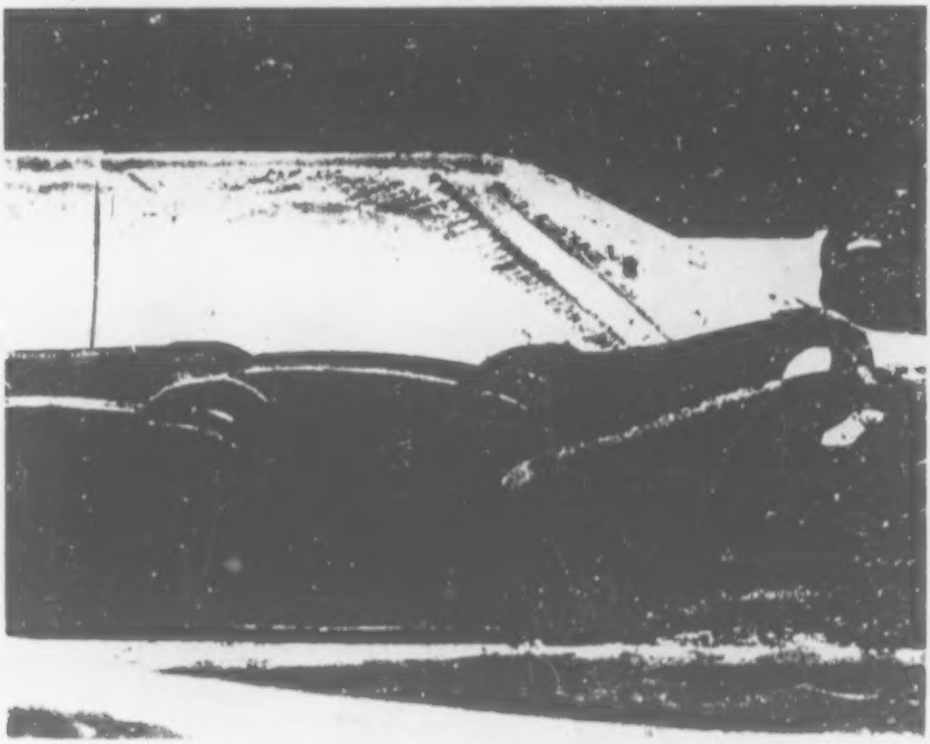
DETERMINATION OF OVERRAM DISTANCE



GOUGE MARKS ON SPANNER TRAY

Here is a picture of that spanning tray with these gouges. Here we are looking forward on that spanning tray, and you see gouges in those areas that are indicated.

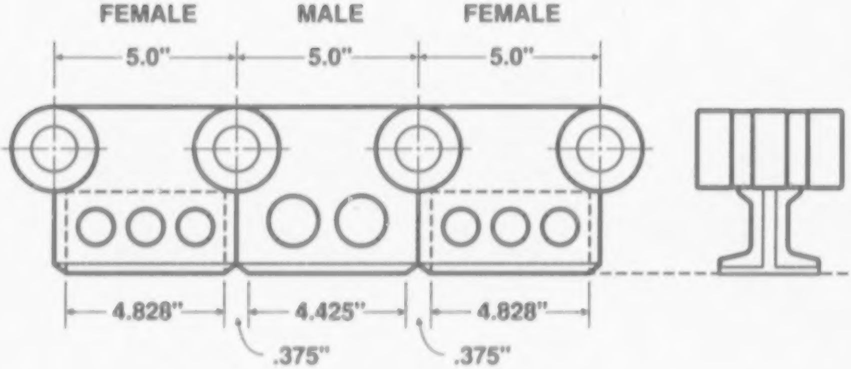
DETERMINATION OF OVERRAM DISTANCE



CLOSE-UP OF GOUGE MARKS ON SPANNER TRAY

Here is another view of that. Here you see some of those gouges in more detail. And in the foreground you see the links of the rammer chain. It is a rather massive chain. Those links are not identical to one another. There are two different kinds of links, and that is shown on the next visual.

DETERMINATION OF OVERRAM DISTANCE

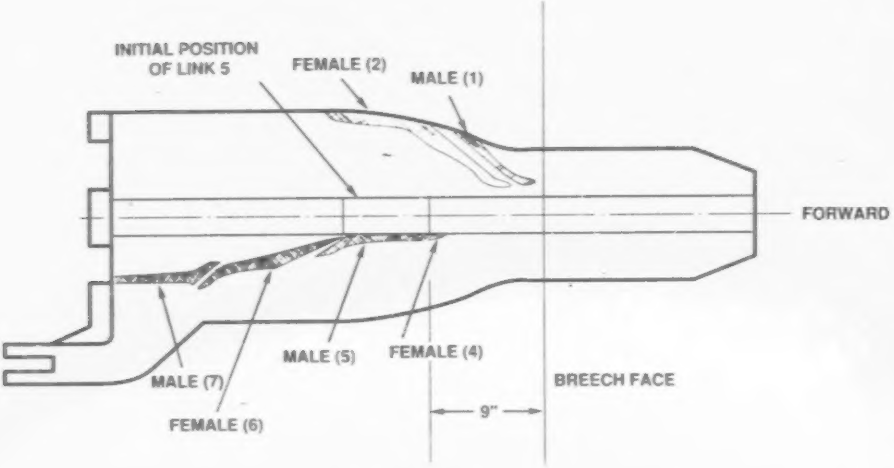


LINK ASSEMBLIES

These links are of two different kinds. They have somewhat different dimensions at the base, as you can see indicated there. And also there is a characteristic spacing between the base of adjacent links.

Karl Schuler of our group determined that the marks on the spanning tray could be associated with specific links in the chain. This is indicated in the next visual.

DETERMINATION OF OVERRAM DISTANCE



GOUGE MARKS ON SPANNER TRAY

The gouges that you see in this schematic are actually now associated with specific link numbers. From this analysis he was able to rather precisely determine that the overram was 24 inches, about 3 inches greater than that determined by the Navy. Now that is very important. With a 21-inch overram, the powder bags were moved too far forward into the breech, but they were not quite at the projectile.

In an overram of 24 inches, this means that the powder bags were not only moved up to the projectile, but they were actually jammed into the projectile. And that is quite an important point.

We confirmed that the powder bags were overrammed against the projectile and determined that the extent of the overram was approximately 3 inches greater than that established by the USN.

Our analyses indicate that the bag charges were under a compressive load of at least 2800 pounds at the time of the explosion. There may have been even higher transient forces due to dynamic loading resulting from a greater than normal ram speed.

While the rammer is capable of a speed of 13.9 ft/sec, we could only establish that the rammer speed was at least 2 ft/sec.

So this leads to our third conclusion. And again, let me go through that. We confirmed that the powder bags were overrammed against the projectile and determined that the extent of the overram was approximately 3 inches greater than that established by the Navy.

Our analyses indicate that the bag charges were under a compressive load of at least 2,800 pounds at the time of the explosion. There may have been even higher transient forces due to dynamic loading, resulting from a greater than normal ram speed. That is to say, if the ram were moving at some speed it would jam these bags against the projectile and create peak loads that were greater than 2,800 pounds.

While the rammer is capable of a speed of 13.9 feet per second, we could only establish that the rammer speed was at least 2 feet per second. That was based on physical evidence related to the position of the rammer handle and valve positions in the hydraulic system, and things of that nature.

The last major topic deals with impact initiation of the propellant. This ties very directly into this idea of the overram that was just discussed which actually forced the propellant bags into the rear of the projectile. The Navy reported that—and I quote—"Impact and compression of the bag charges were not contributing factors in the *Iowa* incident."

Our results raise some real questions about that statement. We have conducted experiments that indicate that the fracture of pellets of the propellant can lead to initiation. The arrangement of pellets in the bag in shown in the left-hand side of this visual. The pellet bag, is a right cylinder, as you can see.

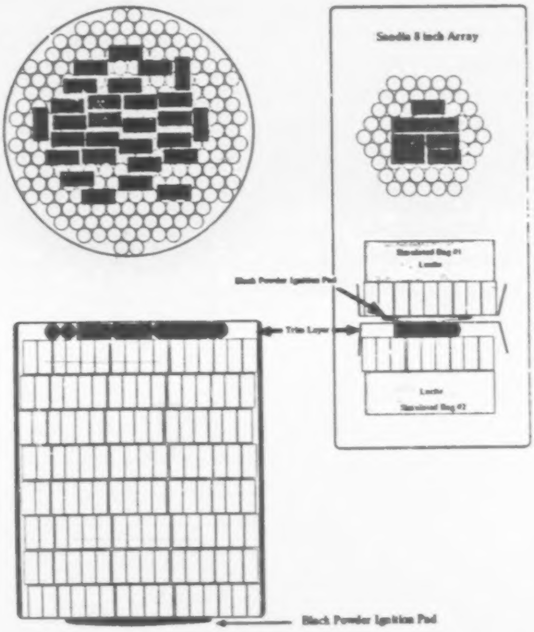
Note that most of the roughly 1,800 pellets are arranged in eight stacked layers, very neatly arranged in hexagonal, close-packed arrays. Some additional pellets are located in the trim layer at the top of the bag. These trim pellets are used to adjust the total weight of propellant, and these pellets lie on their side at the top of the bag.

Note the black powder pouch is at the end of the bag shown here.

Now in an overram situation in which the bags are impacted and compressed against one another, the load can be concentrated into this area of that incomplete layer. Moreover, the pellets that are lying on their side like that are much more easily fractured than those that are standing in the upright orientation. We have done mechanical studies of these pellets to verify that.

D-846 POWDER BAG CONFIGURATION

93.6 lb of 16-45 Inch Pellets in 8 Stacked Layers (≈225 Pellets) + 1 Trim Layers (≈35 Pellets)



In order to assess the effects of impact, Paul Cooper set up the experiment which is shown on the right-hand side of this visual. If we look at the upper part of that figure, Paul's experiment at the 8-inch size shows an 8-inch array of these pellets, and we are looking down on that 8-inch array. And then on the top of that array is the trim layer—in this case, seven pellets located in that array.

This array models the forward end of the bag. And this was placed beneath a counterpart of it that models the aft part of the next bag, which includes the black powder pouch. So that you see at that interface the black powder ignition pad and the trim layer adjacent to it.

This assembly was located in a fixture in one of our explosive test sites and a weight was dropped on this combination from various heights to simulate various overram situations. As the height of the weight was gradually increased, one eventually got to the point that these trim layer pellets were fractured. And moreover, they gave off burning particles that ignited the adjacent black powder pouch.

The ignited black powder pouch then rapidly ignited the rest of the pellets in the experiment. That is, there is a kind of important interaction here that occurs, a sort of a synergism that takes place between the fractured trim layer pellets and the adjacent black powder pouch.

We have a short video of one of these experiments that we would like to show you.

[Video is shown.]

In this experiment you can see that the 8-inch array of these pellets have been grouped together. They are put on top of a piece of lucite which represents the rest of the pellets on down in the system.

Now the video shows that the trim layer pellets were added—in that case there were seven, then a layer of silk that represents the end of the bag, a layer including the black powder pouch, another set of pellets, and then the lucite. This assembly was put into the fixture that Paul Cooper had designed and was tested in a way that will be shown in just a moment.

I am going to fast forward through a section of the test that is not germane to the discussion. But you will see now that the fixture there; the smaller part almost right in the center represents the fixture that I just described. The upper part represents weights that have a mass which is like the inertial mass of the rammer used aboard these battleships.

Now the idea is——

Chairman NUNN. Would you tell us now—are you trying to get as close as you can with this kind of rigging to the——

Dr. SCHWOEBEL. Yes, that is the idea. We are trying to develop as much similarity as we can. However, there are some real questions of how you extrapolate these things, but I will get into that as we go along.

Chairman NUNN. Okay.

Dr. SCHWOEBEL. The weight then was raised, and as I think most of you saw, it initiated the system and there were some explosions that took place.

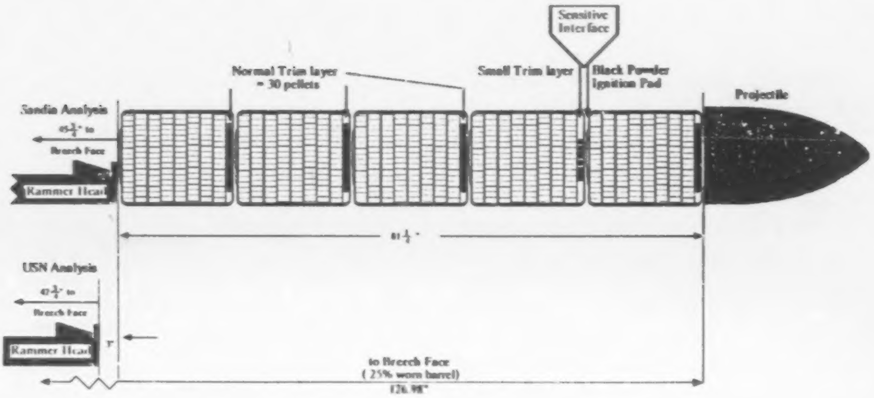
Chairman NUNN. Would you run that back and let us take a look at that?

Now what we are seeing there is the ignition?

Senator BINGAMAN. Could I just ask for clarification. That is the pellets going off after the powder has been ignited, is that what is happening there?

Dr. SCHWOEBEL. The pellets are being fractured by the compressive load of the weight. When they fracture they give off burning particles. Those burning particles ignite the black powder pouch which is lying adjacent to it. And that black powder pouch then rapidly propagates the ignition through the rest of the system. That is the idea.

CONFIGURATION OF D-846 BAGS AT TIME OF EXPLOSION



Senator BINGAMAN. Thank you.

Dr. SCHWOEBEL. In the 16-inch gun situation, the bags would be arranged in this manner. There are five bags there, as you can see. The trim layers are as indicated. The most sensitive interface is the interface between bag one and bag two. The number of pellets in the trim layer is an important factor, as is the rammer speed. That is, the energy that you put into this system.

Now the number of pellets in the trim layer there, if you might indicate that in the visual, the number of pellets is not a constant. It varies, because these pellets are not all of the same length. When you adjust the bag weight that number can vary. And we understand from the technical team of the Navy that it varies between roughly 20 and 60.

We are getting some actual statistics on the number of trim pellets so that we will understand that a little bit better.

Senator WARNER. That variable is introduced to make the weight of the bags uniform?

Dr. SCHWOEBEL. That is correct.

Senator WARNER. And you just add so many pellets to bring up each bag to, what is it, 98.6 pounds?

Dr. SCHWOEBEL. It's 93.6 pounds.

Senator WARNER. So that is the reason for the variation in the number of those pellets.

Senator COHEN. Mr. Chairman, could I ask one other question?

Chairman NUNN. Certainly.

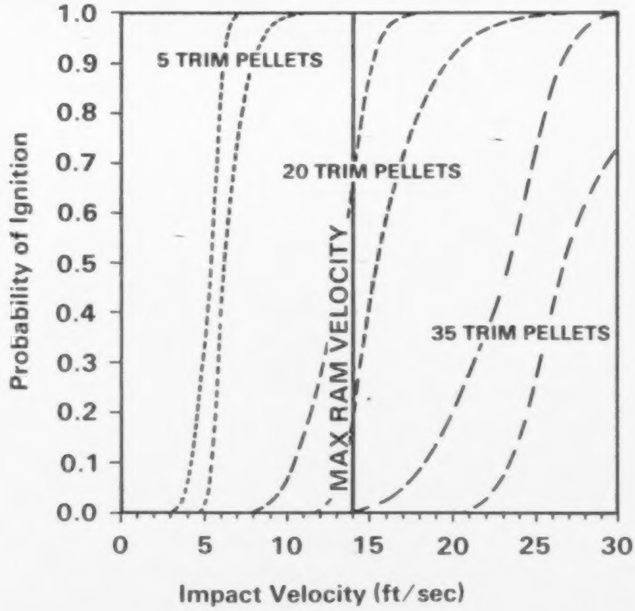
Senator COHEN. Has that historically been the situation from World War II forward? I know Mr. Conahan said that they are still using basically the same training manuals as they were in World War II. And my question was, well, what has changed, if they are using the same system that they had in World War II? And the question I would have is, has that been the process that has been used over the years with these pellets at the top, which fragment easily because they are loose?

Dr. SCHWOEBEL. As far as we know this same system has been used for many years. I believe the correct weight is actually 93.4 pounds.

So the number of pellets then varies. It is not a constant. Also, the rammer speed can be varied by the rammer operator. And so that is also a variable in this system.

Paul Cooper has extrapolated his results to the full size of the bag charge used in the 16-inch gun. I would hasten to add that these are extrapolations at this point, and there are uncertainties associated with those kinds of things, but, nevertheless, we felt that they were very germane.

PROBABILITY OF IGNITION VS. IMPACT VELOCITY EXTRAPOLATED TO A 16" FIXTURE



The results shown here are of the extrapolation in this data for the probability of initiation, versus the speed of the rammer for trim layers of different numbers of pellets. This graph is not as complicated as it looks.

The probability of ignition is indicated on the vertical axis on the left. The impact velocity is indicated on the axis along the base. Those bands that you see, like 35 trim pellets, is the extrapolation for that group of the probability versus speed. Then for 20 trim pellets and last, for five pellets, that band.

Chairman NUNN. You go from one-tenth up to one. What does the probability of one mean?

Dr. SCHWOEBEL. One means that it is a certainty.

Chairman NUNN. A certainty.

Dr. SCHWOEBEL. Now note that if the velocity is 2 feet per second, down in the normal range of what is authorized for these ramming operations, that even if an overram occurred, even if you moved the bags too far up against the projectile, that apparently, from our extrapolations, with almost any number of trim pellets, the probability would be extremely low that anything would happen.

So for an authorized operation, following the prescribed procedure, there should be no problem. However, for the case of high speed overram, it is quite different. If we go up to 14 feet per second, which is that vertical line, the maximum ram velocity, and if we have 20 pellets in the trim layer, as indicated there, and that is in the low range of what is actually observed in these bags, we find that the probability of initiation varies between about one in two to one in three. So it becomes a significant probability in this extrapolation.

Again, I say that these are extrapolations from one-half scale experiments, and we need to establish that such an extrapolation is justified.

Senator GLENN. Mr. Chairman, could I ask a question?

Chairman NUNN. Senator Glenn.

Senator GLENN. Would not the area of the trim layer that you are impacting on be a key factor there? And that has not been figured in.

In other words, if you took your trim layer down to a point, say, like that, obviously the pressure on that and the ignition likelihood would be tremendous. It would be—you know, you could ignite anything with that kind of pressure almost. The area that is spread over would be very key to this. And what is your average bag, then, that has a trim layer in it, what is that area? And did you figure that in? I think that would be a key element on what you are figuring here.

Dr. SCHWOEBEL. Yes. You are absolutely right. And the area of the trim layer is really established by how many pellets that you have there. That represents the areal density. So you are absolutely right.

Now if you group those in different ways on that upper surface, there may be an effect associated with that.

Senator GLENN. Do they get out of line? Say you have little points even sticking out off of the trim layer itself, which would make, in effect, a point that you are concentrating on, is that a factor?

Dr. SCHWOEBEL. We have not had access to a large number of these bags so that we can look at trim layers in great detail. Our studies dealt with some of the larger grosser features of these trim layers. For example, how many pellets that you have in the trim layer, and how that affects the initiation probability.

What you point out may be quite important, in fact, but we have not actually determined that.

Senator GLENN. I think that would be a rather key factor on knowing what the bags contain—you would want a certain number in the trim layer because that absorbs your energy over a flat surface, right?

Dr. SCHWOEBEL. That is correct. And in fact it suggests that maybe one might even like to do away with the trim layer altogether so that you do not have the susceptibility built into the system.

Senator GLENN. Just one other question. The trim layer—is that figured into the explosive capacity of the bag? Because when you are trying to trim this thing down to a very fine level or find explosive capacity per 92.6 or whatever it is, does your trim layer then have a variation of explosive capability that is not the same as the rest of the bag?

Dr. SCHWOEBEL. No, the pellets are identical to those that are used in the rest of the bag. It is just a way of making sure that when you add up all of those pellets that you end up with exactly the right weight of pellets.

Senator GLENN. And when we talk about pellets in this case, we are not talking about double-aught buckshot size or something like that, we are talking about what, square grains, or what size?

Dr. SCHWOEBEL. These pellets are about the size of your thumb, about three-quarters of an inch in diameter and a couple of inches long.

Senator WARNER. Geometric orientation of those added pellets is also a factor, is it not?

Dr. SCHWOEBEL. Yes, that is correct. The pellets will fracture more easily when they are lying on their side. And that is because of the extruded nature of the material.

Senator WARNER. Do you know if there is any uniformity in the way in which the Navy adds those pellets, in terms of their geometric orientation? Or is it just a handful of them tossed in there?

Dr. SCHWOEBEL. No, they are laid in this transverse manner, as I indicated. And the idea is just to bring the weight up to the proper amount. You keep adding them until you have the proper weight.

Senator WARNER. Are they held in place in some way, so that as the bags are handled they do not change into a different geometric orientation?

Dr. SCHWOEBEL. No, they are not. They can move around in the bag.

Senator WARNER. So they are free movers in the bags?

Dr. SCHWOEBEL. That is correct.

Senator COHEN. Mr. Chairman, could I ask one other question? My understanding is the average number of pellets in the trim layer averages about 25, and that the Navy has not found any bags that have less than 17. Now, the detonation that took place yesterday contained five pellets. Are we to draw any conclusions from that?

Dr. SCHWOEBEL. Well, the result yesterday, I think, is kind of one point on this curve, that now helps you to understand how you should better extrapolate these kinds of results to a full size.

Senator COHEN. So if they were bags—let us assume, hypothetically, that some bags were torn and you had fewer than 17, that you may have had as few as 5, would that tend to give more credence to the experiment that took place yesterday?

Dr. SCHWOEBEL. Yes, it would. We talked with some people that we felt were very knowledgeable in the Navy about the torn bag situation and the loss of pellets in that way. Our understanding is that this would not occur with these modern bags, with the wearsaver on them. A number of people told us they had never seen torn bags of this nature.

Senator COHEN. Did not the Navy's investigation indicate there were some torn bags?

Dr. SCHWOEBEL. Yes. There was an earlier lot of propellent that used old material. That is the materials were very old, and those bags we understand were rather fragile and there were a number of cases in which those bags did indeed open. But this explosion did not involve that kind of material.

Senator WARNER. That is a key question. Was the test conducted yesterday using this very low number realistic in view of the fact that such a low number is not probable? In other words, is that low number, the probability of there being only four or five pellets, very, very remote?

Dr. SCHWOEBEL. I will let one of the people who was actually there——

Chairman NUNN. Is this a good time to get into yesterday's test, because that is where we are heading right now? Does it make sense to do that now, or would you rather come back on that?

Dr. SCHWOEBEL. I would just have one more thing that I would go through in about 5 minutes and then we could go right to that.

Chairman NUNN. Why do we not do it that way, and we will come back and go into whatever detail we need to on yesterday's test?

Dr. SCHWOEBEL. Okay, very good.

Chairman NUNN. We might want to get this chart back up there when we get back to yesterday's test.

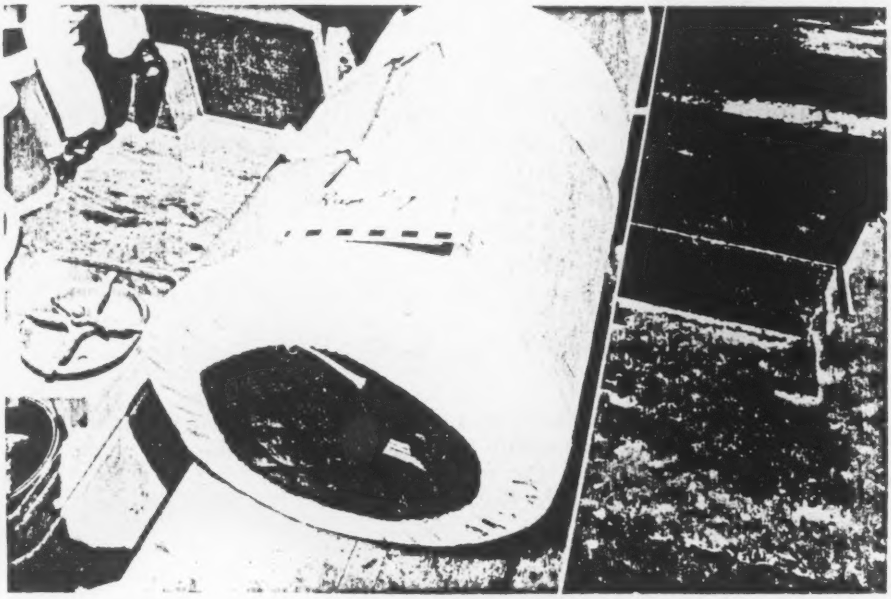
Dr. SCHWOEBEL. Absolutely.

Now, as you can imagine, we believe that this is an extremely important result, and clearly more work needs to be done to relate these results to actual 16-inch gun conditions.

Chairman NUNN. What you showed us really, as I understand it, is another scenario which could explain the explosion?

Dr. SCHWOEBEL. It suggests a different scenario, yes. It suggests another way, a simple scenario in which the explosion may have occurred.

FRACTURED PELLET OBSERVED IN USN OVERRAM TEST



I would like to show a picture of a bag that came from a Navy overram test. What I would like to point out here is that this is one of the overram tests run some time ago by the Navy. There is a broken pellet that we can see there, a fractured pellet, and it is actually sticking right through that black powder pouch. Now that, to us, would be very suggestive of something that you would like to avoid at any cost.

Senator GLENN. Mr. Chairman, could I ask one more thing?

Chairman NUNN. Yes.

Senator GLENN. How mobile are these trim layer pellets within the bag? In other words, if they are jostled, or they are rolled, or the bag is hit or something like that, do they rearrange themselves somewhat? Are they pretty much an adjusted flat layer and that is it, as a trim layer?

In other words, if they are sort of loose in that end of the bag and can rearrange themselves, you could have points sticking out all over that might be your focal point of energy and heated up to an emission level. Do we know whether those things are pretty solid in there, or can they rearrange themselves with jostling and maybe get themselves out of whack, where they are going far away from a flat surface that you would like to have?

Dr. SCHWOEBEL. They can move around, but they tend to stay in the plane, of course. But if you have one of these bags you can take your finger along the top part of it, for example, and move a pellet across that trim layer, or move it to the side. There is no problem in moving them around.

Senator GLENN. Is there enough flexibility in the bag that one pellet under jostling could have gotten on top of another one, or something like that, that would make even more of an impact point?

Dr. SCHWOEBEL. It may be possible. I would think it would be unlikely.

Senator GLENN. Thank you.

Senator WARNER. Well, you know, we are in the area of speculation. This gun has operated 20,000 plus times, and it is this system that has been utilized, so you said, throughout the history of the use of this gun; you said it provides a rather simple explanation as to how an accident could happen, and I wonder if you want to revisit the word "simple"?

Dr. SCHWOEBEL. Well, I will revisit that as we go along.

The cause of the explosion was not conclusively determined.

However, an important factor may have been the increase in impact sensitivity of a powder bag with a reduced number of pellets in its trim layer. (The trim layer is an incomplete layer of pellets lying on their sides in the front of the bag and just behind the black powder pouch on the next bag.)

Our half-scale experiments indicate that reducing the number of these pellets lying next to the powder pouch increases impact sensitivity enough that an explosion could have been caused by an overram at a higher than normal speed. Our studies indicate that impact initiation depends on two key factors: the number of pellets in the trim layer, and the speed of the overram.

However, these experiments must be extended to actual 16" gun conditions to establish the validity of this ignition mechanism.

Let us then go to the conclusion that we have. The conclusion is that the cause of the explosion was not conclusively determined. However, an important factor may have been the increase in impact sensitivity of a powder bag with a reduced number of pellets in its trim layer. Our half-scale experiments indicate that reducing the number of these pellets lying next to the powder pouch of an adjacent bag increases impact sensitivity enough that an explosion could have been caused by an overram at a higher than normal speed.

Our studies indicate that impact initiation depends on two key factors: the number of pellets in the trim layer and the speed of the overram. However, these experiments must be extended to actual 16-inch gun conditions to establish the validity of this ignition mechanism. A point that I would make in response to your question is that certainly there have been many, many loadings that have been—obviously have gone on without problems. However, in this case, it may have been a situation in which you do have a low number of trim grains.

This case was quite different in that a substantial overram of some kind occurred, and that clearly falls outside the normal procedures that take place in these gun rooms. What happened here, I think, was quite abnormal in terms of the operation.

Now, our experiments on initiation by impact are incomplete and more work needs to be done. Nevertheless, Mr. Chairman, it appears from our present models that the probability of initiation by impact is such that measures should be taken to ensure overrams are precluded at any speed.

Based on our studies of the explosion in the gun turret of the USS Iowa, we recommend the following:

1) **A mechanism should be added to these guns to control the speed of the rammer and the placement of the powder bags.**

2) **A new bag charge design should be developed in which the weight of the propellant can be adjusted without the use of a trim layer of pellets. Such a design would be much more robust and less sensitive to impact.**

3) **Studies of propellant-impact sensitivity should be broadly extended and include both commonly used propellants, D846 and D839. The objective of such studies should be to fully define the safe limits of pellet configuration, bag compression, rammer speed, and other relevant 16" gun and turret operations.**

The last visual shows our recommendations and the very first one of those speaks to what I just said. We believe that a mechanism should be added to these guns to control the speed of the rammer and the placement of the powder bags. Not only the speed, but how far the bags are moved into the breech.

Second, a topic that we spoke about a few minutes ago, a new bag charge design should be developed in which the weight of the propellent can be adjusted without the use of trim layer pellets. Such a design, we think, would be much more robust and less sensitive to impact.

Last, studies of propellent impact sensitivity should be broadly extended and include both of the commonly-used propellants, D-846 and D-839. The objective of such studies should be to fully determine the safe limits of pellet configuration, bag compression, rammer speed and other relevant 16-inch gun and turret operations.

Chairman NUNN. I assume you have made all of these recommendations known to the Navy?

Dr. SCHWOEBEL. This is the first report that we have made to the GAO and to you people. This information will be published.

Chairman NUNN. It will be made available?

Dr. SCHWOEBEL. That's correct. This concludes this part of the presentation. Thank you very much for your kind attention.

[The information provided by Dr. Schwoebel follows:]

Introduction

SANDIA OVERVIEW

Sandia National Laboratories is operated for the U.S. Department of Energy by Sandia Corporation, a wholly owned subsidiary of AT&T, on a no-profit, no-fee, no-cost basis.

Sandia is one of the nation's largest research and development facilities. Its headquarters and its main laboratory are located on Kirtland Air Force Base on the southeast edge of Albuquerque, New Mexico. Another Sandia Laboratory complex in the San Francisco Bay area just east of the city of Livermore adjoins Lawrence Livermore National Laboratory and was established in 1956 to provide a close working relationship with that lab. Test ranges are operated near Tonopah, Nevada, and on Kauai, Hawaii.

About 60 percent of Sandia's research and development effort involves the weaponization of nuclear explosives for national defense; the remainder involves energy programs and advanced military technologies.

Sandia employs about 8,400 persons. Approximately 60 percent are in technical and scientific positions, and the remainder are in crafts, skilled labor, and administrative classifications. About 7,250 persons work in Albuquerque and about 1,050 in Livermore. The total includes more than 100 at the Tonopah Test Range, the Nevada Tests Site, and elsewhere.

Sandia operates a broad range of facilities, many of them unique. They are used for a wide variety of projects, ranging from basic materials research, a relatively large program, to the design of specialized parachutes. Assets, owned by DOE and acquired at a cost of more than $1.1 billion, include about 600 major buildings containing more than 4 million square feet of floor space. They are located on land totaling approximately 562 square miles, most of which is at Tonopah Test Range.

The facilities include state-of-the-art equipment for environmental testing, radiation research, combustion research, computing, and microelectronics research and production. Other major facilities include a full-service Technical Library for employees; a Primary Standards Laboratory; transonic, supersonic, and hypersonic wind tunnels; and design, fabrication, and process development laboratories.

A major part of Sandia's activities include the research and development of explosives technology and componentry. These activities involve the engineering of explosive, pyrotechnic, and propellant devices including detonators, detonation systems, deflagration-to-detonation transition devices, gas generators, igniters, rocket motors, and firesets.

Multi-department activities dealing with experimental and analytical studies related to initiation, ignition, and detonation phenomenology, together with the development and application of computer codes and models for analysis and design are also part of the overall explosive activity. A significant effort is also devoted to the study of materials behavior and performance as affected by exposure to stockpile and abnormal environments together with the assessment of aging and compatibility effects.

To support these activities, Sandia has capabilities of testing large quantities of explosives, in excess of 100 lbs., with a wide range of high quality, state-of-the-art instrumentation.

USS IOWA INVESTIGATION

The Senate Committee on Armed Services (SASC) investigation of the *USS IOWA* Incident resulted in a request by Senator Nunn to the GAO on October 3, 1989 for assistance in determining the adequacy of the *USS IOWA* investigation. The GAO, after consultation with the National Science Foundation, asked Sandia for assistance with this matter and the SASC joined in this request. On November 22, 1989, Dr. Albert Narath, President of Sandia, agreed to the Laboratory providing consultation to the GAO and to undertaking a technical study providing the DOE authorized the work. Dr. Roger L. Hagengruber, Vice President of Exploratory Systems, Sandia, was assigned responsibility for managerial oversight for this activity and for coordination with the DOE. Dr. Richard L. Schwoebel, Director of Components, Sandia, was assigned the technical lead. On February 2, 1990, Martin Ferber, Director of Navy issues, GAO, sent a letter to Robert Y. Lowrey, U.S. DOE, Albuquerque Operations Office, formally requesting Sandia increase its level of support to include a detailed study of certain issues related to the Navy investigation. Specifically he asked Sandia to 1) examine pieces of the rotating band and 16-inch projectile removed from the *USS IOWA's* gun for evidence of foreign material that may be related to a detonating device, 2) test gun powder from the *USS IOWA's* magazine and other gun powder of the same lot obtained elsewhere to ascertain the stability of the material, and 3) review the scope and methodology of the Navy's technical investigation and *other evidence* the Navy believes supports their conclusions about the probable cause of the explosion. DOE and Sandia agreed to undertake the study; however, it was felt that item #3 was not an appropriate task for a national laboratory and GAO concurred.

Sandia's principal interfaces in this study included: Richard D. DeBobes, Counsel, Senate Committee on Armed Services; Martin M. Ferber, Director of Navy Issues, National Security and International Affairs Division, U.S. GAO; Richard J. Herley, Assistant Director, Navy Issues, National Security and International Affairs Division, U.S. GAO; Tim Stone, Evaluator, U.S. GAO; Capt. Joseph Miceli, USN, Director, Technical Investigation Team, Naval Sea Systems Command; and Stephen E. Mitchell, Department Head, Gun/Missile Propulsion, Naval Ordnance Station, Indian Head, MD.

Sandia's approach to this study was to establish an advisory group to help develop the overall program planning. This group in turn established four technical teams and an administrative support team to execute the actual study. The technical team included a chemical analysis team, an explosives studies team, a modeling team, and a fault-tree analysis team. A list of the members of the advisory group and team members follows.

Advisory Group

Dr. Richard L. Schwoebel, Chairman
Dr. John M. Holovka, Project Leader
Mark J. Davis
Paul W. Cooper
Dennis E. Mitchell

Project Teams

Chemical Analysis
Dr. James A. Borders, Leader
Dr. Suzanne H. Weissman
William B. Chambers
Dr. Samuel M. Myers
Dr. William R. Wampler
Dr. Gerald C. Nelson
Dr. David R. Tallant
Dr. Barney L. Doyle

Explosives Studies
Dr. David H. Anderson, Leader
Dennis E. Mitchell
Paul W. Cooper
Dr. Steven M. Harris
Thomas M. Massis
Dr. Marvin E. Morris

Modeling
Dr. Karl W. Schuler, Leader
Dr. Melvin R. Baer
Kenneth W. Gwinn
Dr. Kathleen V. Diegert

Fault-Tree Analysis
Dr. Arthur C. Payne, Leader
Dr. Steven M. Harris

Support
Linda M. Vigil-Lopez, Leader
Judy K. Jewell
Waylon Ferguson
Marty L. Noland
Carmen G. Drebing

The teams were each given objectives based on the GAO tasking, and they in turn prepared team plans with the understanding that these studies were to be completed by May 18, 1990. This allowed for a final report to be available by May 29, 1990. It was further understood that some results would necessarily be preliminary and studies would continue beyond May 18 until GAO, DOE, and Sandia agreed to terminate the studies.

Immediately after structuring the program, the advisory group, team leaders and interested team members met initially every week to review the progress of the project and later twice weekly as the May deadline approached. These meetings were attended by GAO on January 16-17, February 22, March 6, March 30, and May 18, and by representatives of the USN on January 16-17, March 15-16, March 26-27, and April 26-27. These interactions were extremely helpful in focusing our studies.

The technical team concentrated initially on reviewing the results of the Navy investigation, which were aided by several visits to various Navy installations, as well as visits to the *USS IOWA*, and later to the *USS WISCONSIN* and *NEW JERSEY*. Navy, FBI, and Army personnel also visited Sandia to brief us on their respective investigations. The Navy was particularly helpful by giving the Sandia staff on January 16-17 a very detailed briefing on their entire *USS IOWA* investigation. Throughout the Sandia study, the Navy continued to be very cooperative and informative. After the initial learning phase, the technical teams concentrated on independent analyses of areas of interest to the GAO.

VITAE

VITAE

Dr. Roger L. Hagengruber is currently Vice President of Exploratory Systems, 9000. He received a B.S. in Physics and American Institutions, an M.S. in Physics, and a Ph.D. in Physics from the University of Wisconsin. He also did graduate studies in National Security Management at the Industrial College of the Armed Forces and graduate studies in International Diplomacy and Law at the University of New Mexico. From 1971-1972 Roger was an Assistant Professor of Physics at the Western Michigan University. He joined Sandia in 1972, advancing through the management line until he was promoted in 1986 to Vice President, Exploratory Systems. His responsibilities include the management of national security work at Sandia for all organizations except the DOE. Roger is also an adjunct professor of Political Science (1976-present) at the University of New Mexico.

Dr. Richard L. Schwoebel is currently Director of Components Organization, 2500. He received his B.S. (1953) in Physics/Math from Hamline University, and his Ph.D. (1962) in Engineering Physics from Cornell University. Richard joined Sandia in 1962 as a Member of the Technical Staff. In 1965 he was promoted to Supervisor, Surface Kinetics Research Division, and in 1969 to Manager, Materials Research and Development Department. Further promotion to Director, Materials and Process Sciences Directorate 1800 followed in 1982. He assumed his present position in the Components Directorate in September 1988. He is a Fellow of the American Physical Society, a Senior Member of the American Vacuum Society, and is on the Publications Committee for the Materials Research Society.

Dr. David H. Anderson is currently Manager of the Explosive Component Department, 2510. He received his B.S. (1953), M.A. (1955), and Ph.D. (1959) degrees in Physical Chemistry from Northwestern University, Harvard, and the University of Illinois, respectively. Dave joined Sandia in 1959 as a Member of the Technical Staff. He was promoted to Supervisor in 1962 and to Department Manager in 1971. He has been directly involved in explosives, pyrotechnic and propellant development and utilization activities for the past 20 years as Manager of the Explosive Components Department. Department responsibilities include design and development of detonating and pyrotechnic components, explosive subsystems and diagnostics in support of DoD and DOE programs. He is active in the International Pyrotechnics Seminar, the Detonation Symposium, and is the primary representative on the joint DoD/DOE Explosive Device Technology Exchange Group.

Dr. Melvin R. Baer is currently a Distinguished Member of the Technical Staff in the Fluid and Thermal Sciences Division, 1512. He received his B.S. (1970), M.S. (1972) and Ph.D. (1976) in Mechanical Engineering from Colorado State University. He joined Sandia in 1976 as a Member of the Technical Staff, and was promoted to Distinguished Member of the Technical Staff in 1989. He has been involved in the modeling of ignition, deflagration and detonation processes in propellants, explosives, and pyrotechnics.

Dr. James A. Borders is currently Supervisor of the Materials Compatibility and Reliability Division, 1823. He received his B.A. in Physics from Reed College in 1963, his M.S. in Physics from the University of Illinois in 1963, and his Ph.D. in Solid State Physics from the University of Illinois in 1968. He joined Sandia in 1968 as a Member of the Technical Staff and was promoted to supervisor in 1978. His areas of expertise include energetic ion analysis, ion implantation, radiation effects in insulators, and surface characterization of materials.

William B. Chambers is currently a Member of the Technical Staff in the Process Characterization Division, 1824. He received his B.S. in Biology/Chemistry from the University of New Mexico in 1973. He joined Sandia in 1985 after 10 years experience as an analytical chemist in environmental and metallurgical analyses and was promoted to MTS in 1990. Since joining Sandia he has been involved in compositional and trace characterization of a variety of materials, primarily by inductively coupled plasma-atomic emission spectroscopy (ICP-AES).

Paul W. Cooper is currently a Distinguished Member of the Technical Staff in the Engineering Projects and Explosives Applications Division, 9333. He received his B.S. in Chemical Engineering in 1958 from New York Polytechnic University and did advance degree work at Illinois Institute of Technology. Paul joined Sandia in 1965 as a Member of the Technical Staff and in 1989 was promoted to Distinguished Member of the Technical Staff. His work involves basic research in explosives phenomena and the design and development of explosives and firing components for DoD and DOE weapon systems. He has prepared and presented several safety courses within Sandia and acts as a general consultant in explosives safety and security matters for other government agencies. He has authored and co-authored numerous reports and articles on explosives utilization and performance.

Mark J. Davis is currently Manager, Research Engineer, for Metallic Materials Department, 1880. He received his B.S. in Metallurgical Engineering from the University of California, Berkeley, in 1960. He received his M.S. in Metallurgy in 1963 from the same institution. He joined Sandia National Laboratories that same year as a Member of Technical Staff. In April, 1968, he was promoted to Division Supervisor, Metallurgy Division, and in September, 1969, to Manager, Metallurgy Department. He managed the Metallurgy Department until March of 1990 when he assumed his present position. During his career Mr. Davis has been personally involved in many failure analyses ranging from rocket motor explosions to volcanic eruptions.

Dr. Kathleen V. Diegert is currently a Distinguished Member of the Technical Staff in the Statistics, Computing and Human Factors Division, 7223. She earned a B.A. in Mathematical Sciences from Rice University in 1972, a M.S. in Operations Research from Cornell University in 1975, and a Ph.D. in Operations Research from Cornell University in 1977. She joined Sandia as a Member of the Technical Staff in 1980 and was promoted to Distinguished Member of the Technical Staff in 1989. She specializes in statistical consulting for weapon reliability analyses and probabilistic risk and safety analyses.

Dr. Barney L. Doyle is currently Supervisor of Ion-Solid Interactions Division, 1111. He received his B.S. in Physics from Kansas State University in 1971 and his Ph.D. in Atomic Physics from the University of North Carolina in 1976. He joined Sandia in 1977 as a Member of the Technical Staff and was promoted to Supervisor in 1987. He has 20 years experience in accelerator physics and 13 years experience in materials science and ion-beam analysis of materials.

Carmen G. Drebing is currently Technical Editor with the Technical Communications Development Division, 3151. She has a B.A. in English from the University of New Mexico and an M.B.A. from New Mexico Highlands University. Carmen joined Sandia in 1981 as a Division Secretary in the Stockpile Evaluation Program Division II. She was promoted to Technical Editor for the Computer-Aided Publishing Division in 1985.

Waylon Ferguson is currently a Member of the Laboratory Staff in Weapon Budget Division, 142. He received his B.S. (1975) from Northern Arizona University and a M.S. in Forest Management (1978) and a M.S. in Financial Accounting (1983) from Colorado State University. Waylon joined Sandia in 1983 as a Contract Auditor. Beginning in 1987, he was assigned as Administrative Assistant to the Director of Components Organization 2500, and was in this assignment until early 1990. In this position, he assisted the Director and organization personnel in administrative and technical matters.

Kenneth W. Gwinn is currently a Senior Member of the Technical Staff in the Advanced Mechanics Division IV, 1524. He received his B.S. degree in Civil Engineering from Oklahoma State University in 1978 and his M.S. degree in Civil Engineering from the same university in 1980. Ken joined Sandia the same year as a Member of the Technical Staff. Major assignments concerned the impact analyses, and shock and vibration of nuclear waste shipping cask transportation, along with the chairmanship of two ANSI committees writing standards for this industry. Current assignments deal with the analysis and design of advanced re-entry vehicles.

Dr. Steven M. Harris is currently a Senior Member of the Technical Staff in the Detonating Components Division, 2513. He received his B.S. (1982), M.S. (1984), and Ph.D. (1988) degrees in Mechanical Engineering from Oklahoma State University where he specialized in heat transfer and fluid flow. He joined Sandia in 1988 as a Member of the Technical Staff. He has been the project leader on the hazards assessment project that deals with energetic material responses to abnormal environments.

Dr. John M. Holovka is currently Supervisor of the Advanced Projects Division III, 9123. He received his B.S. in Chemistry from New Mexico Highlands University in 1965, and his Ph.D. in Physical Organic Chemistry from the University of Utah in 1968. He joined Sandia in 1970 as a Member of the Technical Staff, and was promoted to Supervisor in 1984. He has 10 years of experience in polymer materials science and 10 years experience in explosives materials and component development.

Judy K. Jewell is currently Staff Secretary of the Components Organization, 2500. Judy worked for eight years as a secretary before joining Sandia in 1979 as a Division Secretary. She was promoted to Department Secretary in 1983 and Staff Secretary in 1988. In her 11 years at Sandia, she has worked in the quality assurance, safeguards, systems research, technical library, and components organizations.

Thomas M. Massis is currently a Member of the Technical Staff in the Initiating and Pyrotechnics Component Division, 2515. Tom joined Sandia in 1961 as a Staff Assistant and was later promoted to Member of the Technical Staff. He has a B.S. in Chemistry from the University of Albuquerque and has done graduate work at the University of New Mexico. For the past 27 years, he has been involved in explosive compatibility, aging, stability, and characterization studies. He is also the principal investigator of failures and problems associated with explosive devices and components.

Dennis E. Mitchell is currently Supervisor of Detonating Components Division, 2513. He has B.S. (1968) and M.S. (1969) degrees in Mechanical Engineering from the University of New Mexico and specialized in dynamic response of materials to high strain rate loading. Dennis joined Sandia in 1969 as a Member of the Technical Staff and was promoted to Supervisor in 1988. For 16 of the past 21 years he was involved in all aspects of explosives utilization, performance characterization and application and has done research in the areas of explosive initiation. The last ten years he has been involved in explosive component design and several studies related to energetic materials safety. For the past two years, he has been Supervisor of the Detonating Components Division, whose primary responsibilities include component design and material sensitivity and performance characterization.

Dr. Marvin E. Morris is currently Supervisor of the Electromagnetic Analysis Division, 7553. He received a B.S. in Electrical Engineering from New Mexico State University in 1965, a M.S. in Electrical Engineering from the University of New Mexico in 1967, and a M.S. and Ph.D. in Applied Physics from Harvard University in 1976 and 1977, respectively. Marvin joined Sandia in 1965 as a Member of the Technical Staff and in 1984 was promoted to Supervisor. For more than 17 of the past 25 years, he has worked on electromagnetic problems, with the last ten years concentrated on electromagnetic radiation, electrostatic discharge, nuclear electromagnetic pulse (EMP), and lightning vulnerability of nuclear weapons.

Samuel M. Myers is currently Supervisor of Microstructure and Defect Physics Division, 1112. He received his B.S. (1965) and Ph.D. (1970) in Solid State Physics from Duke University in North Carolina. He joined Sandia in 1970 as a Member of the Technical Staff and was promoted to Supervisor in 1983. He has 25 years experience in materials science and 18 years experience in ion-beam analysis of materials.

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Dr. Karl W. Schuler is currently a Distinguished Member of the Technical Staff in the Applied Mechanics Division II, 1522. He received his B.S. in Mechanical Engineering from Pratt Institute in 1962 and his Ph.D. in Mechanics from the Illinois Institute of Technology in 1967. He joined Sandia that same year as a Member of the Technical Staff, and was promoted to Distinguished Member of the Technical Staff in 1985. While at Sandia he has worked on a variety of analytical and experimental programs related to viscoelastic wave propagation in polymers, dynamic loading of oil shale, and stress wave propagation in complex weapons structures. He has designed experimental apparatus for high pressure research, centrifuge testing of geotechnical models, and hypervelocity launchers.

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William R. Wampler is currently a Senior Member of the Technical Staff in Microstructure and Defect Physics Division, 1112. He received his Ph.D. in Solid-State Physics from Aachen University, West Germany, in 1976. He joined Sandia that same year as a post-doctoral scientist and became a Member of the Technical Staff in 1978. He has 18 years experience in materials science and 12 years experience in ion-beam analysis of materials.

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Executive Summary

This report describes work by Sandia National Laboratories (SNL) relevant to three aspects of the explosion that occurred in the center gun room of Turret 2 of the USS IOWA on April 19, 1989, killing 47 crewmen. Our studies began in December 1989 with initial contacts and information exchange with the United States Navy (USN). Technical work began in January 1990 and continued to May 15, 1990.

The essential results of our study are as follows:

(1) We could neither prove nor disprove the presence of a chemical ignitor proposed by the USN. The interpretation of evidence for a chemical ignitor is complicated by the fact that some chemical constituents of such an ignitor are found throughout 16 in. gun turrets, not only on the USS IOWA, but also the USS WISCONSIN and the USS NEW JERSEY. Forms of these constituents are either commonly used in the turrets or are a part of the maritime environment. Steel wool was another component of the proposed ignitor. We found iron fibers in the rotating band that could be steel wool, but we were unable to clearly identify a source of fibers of their diameter. We believe evidence for the presence of a chemical ignitor is inconclusive.

(2) Our analyses indicate that the propellant stabilizer was within acceptable limits. We also found only a very remote possibility that this propellant could be initiated in the breech by friction, electrostatic discharge, or electromagnetic radiation. Similarly, we conclude there is only a very remote possibility the black powder could have been initiated in the breech by any of these mechanisms. Ether/air combustion cannot be achieved because minimum necessary concentrations are precluded. Even if the minimum concentrations are achieved and combustion occurs, our analyses show that the propellant cannot be ignited. These findings are in general agreement with those of the USN.

(3) We confirmed that the powder bags were overrammed against the projectile and determined that the extent of the overram was approximately 3 in. greater than that established by the USN. Our analyses indicate that the bag charges were under a compressive load of at least 2800 pounds at the time of the explosion. There may have been even higher transient forces due to dynamic loading resulting from a greater than normal ram speed. While the rammer is capable of a speed of 13.9 ft/s, we could only establish that the rammer speed was at least 2 ft/s.

(4) The cause of the explosion was not conclusively determined. However, an important factor may have been the increase in impact sensitivity of a

> powder bag with a reduced number of pellets in its trim layer. (The trim layer is an incomplete layer of pellets lying on their sides in the front of the bag and just behind the black powder pouch on the next bag.) Our half-scale experiments indicate that reducing the number of these pellets lying next to the powder pouch increases impact sensitivity enough that an explosion could have been caused by an overram at a higher than normal speed. Our studies indicate that impact initiation depends on two key factors: the number of pellets in the trim layer, and the speed of the overram. However, these experiments must be extended to actual 16 in. gun conditions to establish the validity of this ignition mechanism.

Navy personnel were most helpful in providing information and materials germane to this study. In particular, we are grateful to Captain Joseph D. Miceli, USN, Director of the Technical Support Team, Naval Sea Systems Command, who responded without fail to a host of requests that grew out of our study. This included arranging for information gathering visits aboard the USS IOWA and two other battleships; extensive interactions with personnel at the Naval Surface Warfare Center (NSWC-Dahlgren), Dahlgren, VA; Naval Weapons Support Center (NWSC-Crane), Crane, IN; Naval Ordnance Station (NAVORDSTA), Indian Head, VA; Norfolk Naval Shipyard (NNSY), Norfolk, VA; Naval Ordnance Station (NAVORDSTA), Louisville, KY; and access to numerous reports and the testimony of several crewmen at the Judge Advocate General manual investigation. We are also indebted to the USN for arranging for us to speak with Gunner's Mate (Guns) First Class Dale E. Mortensen, who drew on his extensive experience to provide us with firsthand information regarding 16 in. gun operations.

The USN investigation of the accident was extensive and included a variety of studies that were conducted in considerable depth. Our studies drew heavily on that work. It served as a valuable basis on which to extend certain elements of this investigation, and made our studies more productive than they would otherwise have been.

Our studies focused on: 1) debris and any foreign materials in the rotating band of the projectile in the center gun; 2) their possible relation to or consistency with the hypothetical ignitor described by the USN; and 3) stability and sensitivity of the propellant and black powder contained in the individual bag charges used on the USS IOWA. The rotating band is located toward the rear of the projectile and, by engaging the rifling of the barrel, spins the projectile to ensure stability in flight.

Studies of debris from the rotating band had been performed by the USN and, to a much more limited extent, by the FBI. Evidence from the rotating band is considered potentially important because the cannelure of the band was exposed to the initial part of the explosion, and then closed as the projectile was propelled partway up the barrel of the gun. (The cannelure is a groove in the rotating band of the projectile.) That is, any foreign material found in the sealed cannelure region of the rotating band might contain important evidence regarding the initiation process. The stability and sensitivity of propellant is of interest because of its age at the time of the explosion (approximately 44 yrs) and the possibility of unforeseen effects of storage at elevated temperatures that occurred during part of the life of this material.

SNL personnel had access to an approximately 10 in. length of the USS IOWA rotating band. (The remaining approximately 40 in. of band had been consumed in experiments by the USN in its studies.) The 10 in. length of the band forwarded to us had originally been sectioned into several pieces and the cannelure opened and examined by the FBI. Accordingly, our studies are based on regions of the cannelure that had been opened, examined, and stored some months before.

The USN reported the presence of calcium (Ca), chlorine (Cl), polyethylene terephthalate (PET) film fragments, certain glycols and iron fibers in the rotating band of the projectile. The USN reported that these were foreign materials and evidence for the presence of an ignitor device composed of steel wool, brake fluid, and an oxidizing chemical (calcium hypochlorite), placed in a plastic bag.

We find that Ca and Cl are readily detectable throughout the entire region of both Turret 1 and Turret 2 of the USS IOWA, Turret 2 of the USS NEW JERSEY, and Turret 2 of the USS WISCONSIN. The presence of these elements is consistent with the maritime environment and the cleaning operations carried out in the turrets. We found these elements on two iron fibers that we extracted from the rotating band from the USS IOWA. We also observed an additional four small iron-fiber fragments that could not be removed from the rotating band for analysis without destroying them. The surfaces of three of these iron-fiber fragments had concentrations of Ca and Cl that were similar to the two that were extracted. (The fourth fiber was retained for another analytical procedure.) The occurrence of these elements on the various fibers does not clearly establish the presence of an ignitor device because the concentrations of these elements are within the statistical variation of Ca and Cl levels on metal fibers found elsewhere in the turret.

The USN had previously removed and analyzed several iron fibers from the USS IOWA rotating band. One of these fibers was described in the NWSC-Crane report to have crusted regions containing high concentrations of Ca and Cl. It was the analysis of this fiber that was the basis of the USN's assertion that iron fibers with abnormally high concentrations of Ca and Cl were found in the rotating band of the projectile of the USS IOWA. When we visited NWSC-Crane to examine this fiber, we found that it, along with some others, could not be located. SNL personnel worked jointly with NWSC-Crane to examine and analyze several other fibers that were retained by NWSC-Crane. All of those fibers were free of crusted regions, as were the six fibers we had previously either extracted or observed in the rotating band at SNL.

The surface concentrations of Ca and Cl on all the fiber samples that we have analyzed, both at SNL and jointly with USN personnel at NWSC-Crane, were of nominal levels, not greatly different from levels of these elements on fibers found in other turret locations. In fact, the concentrations of Ca and Cl observed by both ourselves and the USN were very similar, i.e., only small quantities of Ca and Cl were measured. We could not clearly identify any of the fibers that we extracted as remnants of steel wool. However, these fibers were found to have low (<0.6 at. %) bulk carbon concentrations consistent with steel wool, which is commonly made of iron fibers.

The USN also reported steel wool in the rotating bands of other projectiles stored aboard the USS IOWA. Those fibers could not be located so we were unable to analyze their surface composition. We identified some steel fragments in a brush used to clean the guns in Turret 2, but our analyses indicate that those high-carbon steel fragments came from bore liners inside the barrels. (A bore liner is the inner surface of the gun barrel and in direct contact with the projectile.)

The diameters of fibers found in the USS IOWA rotating band by both the USN and SNL were very similar. The USN states that the fibers found on other projectiles stored aboard the USS IOWA were of smaller diameter. We have not corroborated that observation because those fibers could not be located.

Two glycols in the rotating band of the projectile were identified by the USN as "significant foreign materials," possibly constituents of brake fluid used in the hypothetical ignitor device. Our studies show that the first of these glycols is a constituent of a cleaning and lubricating fluid (Break-Free™) routinely used in the turrets. Our analyses indicate that the USN identification of the second material as a glycol is incorrect. The material is actually phenol, which is also a constituent of Break-Free™. A third glycol, not considered to be a "significant foreign material," was identified by the USN as a constituent of a marker pen. We agree with that identification, but we find that it is also a constituent of Break-Free™.

The USN found a single fragment of a polymer film in the cannelure and identified it as a possible residue of PET. The USN proposed that a plastic bag of this material was used to contain the hypothetical ignitor device. We also identified fragments of this material in the brush used to clean the guns in Turret 2. PET is known to be chemically equivalent to Dacron™ and Mylar™. Accordingly, such fragments could have come from several sources, including the bore socks used for gun cleaning and ordinary clothing. We observed the presence of many polymeric species in the cannelure of the rotating band, but not PET. Because polymeric fragments can be found in various regions of the turret, their occurrence is not a unique indication of the presence of the hypothetical ignitor device.

SNL personnel also examined cannelure debris from a test at NSWC-Dahlgren in which the bag charges were ignited by a chemical ignitor similar to the one proposed by the USN. This ignitor used steel wool, but we found no iron fibers or fragments of iron fibers in the limited length (~8 in.) of the rotating band that we examined. The USN found five fibers in the entire band (~50 in.) from another test of this same kind. Apparently there can be considerable variation in the quantity and distribution of fibers from such experiments.

The USN provided us with twelve bags of propellant with black powder pads from the same lot as that aboard the USS IOWA at the time of the explosion. In addition, the USN provided access to its extensive studies and background information on this propellant and black powder.

The propellant used in the bag charges for the 16 in. guns contains a stabilizer (DPA) that scavenges decomposition products that are oxides of nitrogen. The stabilizer helps maintain uniform performance of the propellant over time. The USN stated that the level of stabilizer in the propellant aboard the USS IOWA was within specification. We also find that the average level of stabilizer is near the level reported by the USN. There is a small change in propellant sensitivity over the range of stabilizer concentration that we measured in pellets from the USS IOWA bag charges. We have not yet completed our investigation of the significance, if any, of this change.

The manufacture of propellant involves the dissolution of nitrocellulose in a mixture of ether and alcohol. Some ether remains in the propellant and evaporates over an extended period of time, suggesting a potential fire hazard. Our analysis shows that the probability of initiating an explosion by ether/air burning in the breech is so remote as to be practically impossible. Calculations show that the maximum temperature increase of the propellant that could occur in the burning of an optimum mixture of ether/air is only 30°C to 40°C. Initiation of the propellant requires a temperature increase of at least 170°C. However, the thermal ignition of finely crushed black powder by ether/air combustion remains an unresolved issue requiring additional study. Our studies also indicate that it is virtually impossible to initiate the propellant or black powder in the breech by electrostatic discharge, friction, or electromagnetic radiation at levels found within the turret.

An interior ballistics model was developed for the open-breech explosion. The model involves the high-speed flow of both hot propellant gases and pellets from the open breech. The model was used to calculate the time variation of pressure at the base of the projectile depending on the point of initiation along the five powder bags. It predicts with some accuracy the movement of the projectile up the barrel following the explosion. Our results indicate that the initiation site was most likely between the first and second bag charge, which agrees with conclusions reached by the USN in its field tests.

The USN reports that the propellant bags were overrammed into the breech of the center gun of Turret 2 by a distance of approximately 21 in. The USN interpretation was based in part on an analysis which assumed that parts of the rammerhead gouged the spanning tray. In our analysis we show that the gouges were caused by the rammer chain. Using this analysis, we found that the overram was more nearly 24 in. That is, the rammer moved approximately 24 in. beyond the point it would normally reach in placing the bag charges in the breech of the gun. Therefore, a significant overram and compression of the powder bags occurred.

The USN reports that "impact and compression (of the bag charges) were not contributing factors in the IOWA incident." Our results regarding the impact sensitivity of the propellant raise the possibility that initiation occurred by impact. Our one-half-scale (8 in.) experiments indicate that the fracture of propellant pellets lying transverse in the trim layer at the forward end of the bag can lead to initiation of the powder train. Initiation apparently occurs when the fractured pellets in the trim layer release burning particles from the fractured surfaces, igniting the black powder pouch of the adjacent bag. Ignition of the black powder then rapidly propagates the ignition throughout the rest of the powder train. Therefore, the ignition process involves the trim-layer pellets of one bag and the adjacent black powder pouch of the next (forward) bag.

We believe the probability of this initiation process depends on two key factors: 1) the number of trim pellets in the forward-most layer and 2) rammer speed. If there are a reduced number of trim pellets and the rammer is operated at higher speeds, the initiation process during an overram becomes more probable. For example, if there are twenty pellets in the trim layer, we estimate there is a probability ranging from approximately one in two to one in three that the propellant can be initiated at energy levels attainable when the rammer is operated at 13.9 ft/s, its maximum speed. However, propellant initiation by impact is a complex phenomena and much more work needs to be done to verify this estimate, particularly in actual 16 in. guns or systems that closely duplicate the 16 in. gun.

During a number of inspections in conjunction with USN personnel, we found that the powder hoist, powder door, rammer, and other mechanisms in the gun room appeared to be in proper operating condition at the time of the explosion. We concur with the USN that mechanical operations appear to have been normal and not associated with the explosion.

As established by the USN investigation, the door to the powder hoist was closed and locked, but the powder car had not been lowered at the time of the explosion. Immediate lowering of the car on closure of the powder door is the standard procedure. This suggests to us that the ramming occurred soon after the closing of the powder door and took place at high speed. That is, if a slow ram of 1 to 2 ft/s had occurred followed by 15 or 20 s of sustained overram as proposed by the USN, the upper powder hoist operator would have had approximately 20 to 25 s to begin lowering the powder car. However, if a high-speed ram occurred, there would have been little opportunity for the upper powder hoist operator to begin lowering the powder car. A high-speed overram seems consistent with these considerations.

A factor that may have contributed to the overram was an undefined problem in the loading operation. This undefined problem, reported through the ship's phone system by a member of the gun crew, led to a delay in loading the center gun relative to both the left and right guns in Turret 2. This undefined problem and delay could have created confusion during the powder-loading phase.

We conclude that a plausible cause of the explosion aboard the USS IOWA was a higher-than-normal speed overram of the bag charges into the rear of the projectile, initiating one of the forward bag charges that contained a reduced number of pellets in the trim layer. The fact that the bags were moved to a position substantially beyond the normal location is evidence supporting a higher-than-normal speed overram.

Our experiments of initiation by impact are incomplete and more work needs to be done on larger assemblies of pellets than we were able to accomplish in the short time available. Nevertheless, it appears from our present models that the probability of initiation of an explosion by impact is such that measures should be taken to insure that overrams do not occur at any speed.

These studies of the explosion aboard the USS IOWA represent a brief but concerted effort by SNL personnel to supplement the USN's investigation. Our starting point was the extensive work by the USN, and those studies were helpful in several phases of our study.

We do not consider this study to be complete in the sense that a clear and definitive cause of this explosion has been identified. There are several open issues that should be further explored, and the Recommendations section of this report lists areas we believe warrant further investigation.

Recommendations

Based on our studies of the explosion in the gun turret of the USS IOWA, we recommend the following:

(1) A mechanism should be added to these guns to control the speed of the rammer and the placement of the powder bags.

(2) A new bag charge design should be developed in which the weight of the propellant can be adjusted without the use of a trim layer of pellets. Such a design would be much more robust and less sensitive to impact.

(3) Studies of propellant-impact sensitivity should be broadly extended and include both commonly used propellants, D846 and D839. The objective of such studies should be to fully define the safe limits of pellet configuration, bag compression, rammer speed, and other relevant 16 in. gun and turret operations.

NOTE: It has been assumed in these Recommendations that the 8 in. experiments will be extended to full scale studies.

Dr. SCHWOEBEL. We can now talk about the tests that took place yesterday.

Chairman NUNN. I think that would be a good procedure. Would you suggest, Dr. Schwoebel, that we have Mr. Cooper and Dr. Schuler go ahead and make their presentation based on the charts, or do you want to get into questions? Are they prepared to tell us what happened yesterday? That is the general question.

Senator GLENN. Mr. Chairman, can we clarify, has the Navy been given this information or not? I was not clear from what you said a moment ago.

Dr. SCHWOEBEL. We have had an excellent interaction with the technical team from the Navy and throughout from the very beginning of our work at Sandia we have made the Navy, I think, feel very welcome to come out to the project meetings that we have every Friday afternoon. They have tended to come on the order of once a month, something of that sort. They were out early in May, the week of May 7, when this work was discussed in considerable detail, and in fact Mr. Cooper gave them a full set of the data.

Senator GLENN. So the information you have given us today, the Navy is fully aware of everything? This is not first time out for some of this information?

Chairman NUNN. My question was to the recommendation. I am not sure.

Dr. SCHWOEBEL. I think that they have not seen this portrayal of probability with speed. That would be something that I do not believe that they have seen, and that is something that we have done quite recently. The curve that we were just looking at.

Chairman NUNN. Senator Glenn, as soon as we, the committee, got this information, we got in touch directly with the Navy.

Senator GLENN. I am concerned all this technical data and so on that is here—which is excellent. I am not questioning it—I am just sort of surprised at your answer a minute ago, which led me to think the Navy was being kept a little in the blind on some of this, if some of this is being released for the first time today. The Navy then will have to analyze this themselves, of course, and go into it, and maybe run additional experiments and so on. That has not been done yet, I know, but I was concerned that they know everything that there is about this. I presumed they already were part and parcel of the whole operation all the way through.

Dr. SCHWOEBEL. They have been very much aware, as I said, of what we have been doing. We have made special efforts to make sure of that.

Chairman NUNN. Senator Cohen.

Senator COHEN. Could I ask Mr. Cooper one question? With respect to the pellets, if you have a low number of pellets and a high overram, you have a likelihood of an explosion?

Mr. COOPER. Some finite probability.

Senator COHEN. Now, if you have a high number of pellets—let us say in a range of 17 to 25—and you have a high overram, what is the likelihood of an ignition?

Mr. COOPER. Again, there may be some finite probability, but at this time we cannot put a real number on that. It is certainly less likely than a small number.

Senator COHEN. So the key really is the number of pellets that are in a bag and the overram? If you have 25 pellets in a bag and you have a high overram, you have a less likelihood of an explosion?

Mr. COOPER. Yes.

Senator COHEN. It is not the overram as much as the number of pellets?

Mr. COOPER. You must have the overram first.

Senator COHEN. But if you have an overram with 25 pellets you are likely to have an explosion?

Mr. COOPER. Right.

Senator COHEN. So the key really is the number of pellets rather than the overram. You have got to have an overram, but if you have an overram with a large number of pellets the likelihood of an explosion is less?

Mr. COOPER. That is correct.

Chairman NUNN. On the other hand, if you have a small number of pellets and no overram, you do not have a problem either, right?

Mr. COOPER. That is correct.

Chairman NUNN. So it is really the combination.

Senator GLENN. Dr. Schwoebel, one key element of this as you pointed out before, was the 3-inch extra overram, and in your statement you say, "We confirm that the powder bags were overrammed against the projectile and determined that the extent of the overram was approximately 3 inches greater than that established by the Navy." How did you establish that? How could you and the Navy come up with different overram figures?

Dr. SCHWOEBEL. You will recall the pictures of the gouges in the tray. The determination of the overram was done by relating those gouges in the spanning tray to the position of the links in the rammer as they were blown backward.

Karl Schuler was able to make a specific relationship between those gouges that you saw and link one, two, three and so on along the rammer chain. This rather precisely positioned the face of the rammer head at the time of the explosion.

Senator GLENN. Does the Navy agree with you now that there was an additional 3-inch overram that they misestimated before or that they were incorrect on before?

Dr. SCHULER. I believe they do, because they were there when I examined that spanner tray at the Norfolk Naval Shipyard. Their analysis had been based on two different techniques: One, they looked at the discoloration and distortion of the rollers and the chain links. This discoloration and distortion presumably was associated with the hot gases that were blown out of the breech.

However, the impulse delivered to the chain also pushed the chain back into its housing. So if you looked at discoloration and distortion, you may underestimate where the chain was initially because it takes hot gases some time to discolor the chain before it slips back into its protective housing.

Senator GLENN. This is different from the Navy investigation. They agree with your new findings of the overram on this, then?

Dr. SCHULER. Yes. The other way they tried to determine where it was, was to look at the gouges. They thought the gouges were due to the rammer head, which is made of bronze, gouging the aluminum.

I felt that in order to gouge the aluminum as deeply as it was gouged, you would have to use a piece of steel, so I tried to associate the bottoms of the chain links with the gouges in the aluminum tray. It was that association that enabled me to decide where the rammer head was initially.

Senator GLENN. Thank you. Thank you, Mr. Chairman.

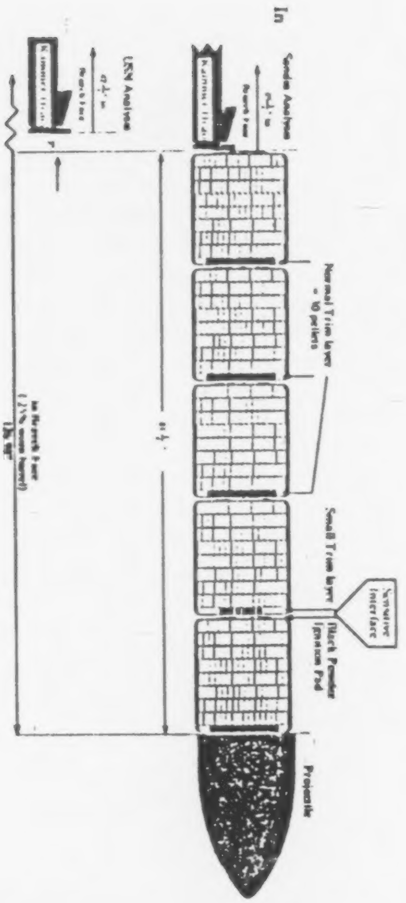
Chairman NUNN. I am trying to determine now the best way to proceed. I think we ought to go back to regular order. I guess what I would like to do if we could is, Dr. Schuler and Mr. Cooper, whatever charts you need up there to refer to, if any of them are helpful, and just tell us in your own words what the experiment was yesterday and the results, and tell us about the overall situation.

Dr. SCHULER. Yesterday's experiment was a drop experiment in which five bags were strapped to a steel plate that provided the weight.

Chairman NUNN. Is that similar to the chart we had up here?

Dr. SCHULER. No.

CONFIGURATION OF D-846 BAGS AT TIME OF EXPLOSION



I will try to improvise from this chart.

The tests at Dahlgren, instead of the rammer head on the top, there was a steel plate about 4 inches thick, and then the five bags were strapped to that steel plate, so initially they were held up against it. Instead of there being a projectile, there was a gap between the bottom bag and the ground, and then that whole assembly was released, hit the ground, and the kinetic energy of the plate had to be absorbed then by the array of bags.

They had been conducting tests of this nature, I believe, for the last week. The tests yesterday that we witnessed were the 17th and 18th tests in that series.

Chairman NUNN. The Navy had been conducting those tests?

Dr. SCHULER. Yes.

Chairman **Nunn**. That was basically what you had told them earlier?

Dr. **Schuler**. Yes. I think they felt this was a very quick way for them to get into full bag testing in a way that they could adjust the kinetic energy that was put into the bag stack and also adjust the number of tare grains at the interface between bags one and two.

When we got there yesterday we witnessed the tests——

Chairman **Nunn**. You just arrived yesterday. You were not there for the other 17 tests?

Dr. **Schuler**. No. When we arrived yesterday we were shown the videotapes of, I believe, the first 12 or so tests, none of which had any reactions, some of which there were some broken grains observed. We observed one test—I think it was number 17—in which five grains were placed in a tare layer, and the five grains were placed very closely packed in the center of the tare layer.

On that test there was no reaction. All the grains were fractured in the tare layer. There appeared to be the possible onset of an event, but there was no event.

In the next test I suggested that the five grains, instead of being clustered together tightly in the center of the test, be moved out slightly. They were arrayed in an arrangement where there was one grain in the center.

Chairman **Nunn**. These are the same things we are calling pellets?

Dr. **Schuler**. Grains or pellets. One in the center and four arranged around it in about a 6-inch diameter circle, 90 degrees apart. That was test number 18 in which the ignition occurred yesterday.

Chairman **Nunn**. Tell us about the ignition.

Dr. **Schuler**. Well, from the high speed video, what you see is a flash of light that apparently came from the trim layer between bags two and three, and then there was just a cloud or a ball of yellow flame followed by a large cloud of white smoke. The scene was obliterated by the explosion going off.

Chairman **Nunn**. Could you tell us the significance of this, Dr. Schuler, in your words, and also tell us any shortcomings of it in terms of being conclusive?

Dr. **Schuler**. Okay. I think it raises the possibility of an event occurring due to this mechanism. However, it clearly was a very severe test in that the trim layer had been depopulated to just five grains. The five grains had been arranged in what I think is a configuration that would tend to put the maximum amount of energy into each of those five grains. The kinetic energy that was delivered due to the drop height was the maximum kinetic energy that could be delivered by the rammer system. So in that sense it represents a severe test.

Chairman **Nunn**. It is severe, but would you also say it is possible? Was it possible that the conditions on the U.S.S. *Iowa* the day of the explosion could have been nearly the same conditions that you had in that test?

Dr. **Schuler**. I cannot say that, because I think in my investigation of the rammer speed, I cannot find any physical evidence that would say the rammer was operating at 14 feet per second. All I can say is that there is a lower bound. It was going at least 2 feet per second. So I have no evidence, first, to the rammer speed that it was going that fast. It could have been but may not have been. There was definitely an overram, which is a condition that is necessary for this.

I do not believe there is any way of knowing how many trim grains there were on the bags that were involved in the incident other than some statistical analysis that may be forthcoming.

Senator WARNER. What is the correlation between the kinetic energy that you applied there in that test yesterday and the ranges of kinetic energy that could have been applied by the rammer in the 16-inch mount on the U.S.S. *Iowa*?

Dr. SCHULER. This test yesterday represented the maximum kinetic energy that the rammer system aboard the U.S.S. *Iowa* could deliver.

Senator WARNER. Now is there any evidence to show that that maximum energy was in fact utilized in the accident situation?

Dr. SCHULER. No.

Senator WARNER. Then why was the test conducted outside of the parameters of the likelihood of what transpired on the U.S.S. *Iowa*? That is my question.

Dr. SCHULER. I believe the reason for conducting the test was to try to extend our results on scale testing to the full-scale situation; and, as such, one of the things one wants to do is establish the probabilities of occurrence. So one has to test at energies that may be over what you could have achieved on the U.S.S. *Iowa*.

I point out again, however, that the rammer on the U.S.S. *Iowa* could have been going at 14 feet per second. We just have no evidence that it was going at that speed.

Chairman NUNN. You have no evidence one way or the other, do you? You have no evidence that it was less than that?

Dr. SCHULER. That is correct.

Chairman NUNN. You have no evidence where it was?

Dr. SCHULER. No.

Chairman NUNN. But you know it could possibly have achieved that.

Dr. SCHULER. That may be going a little bit too far. There is evidence that after the incident the stroking piston of the hydraulic drive was in a position that would correspond to, I believe, 1.7 feet per second.

Chairman NUNN. How does that translate into what the kinetic energy——

Dr. SCHULER. The kinetic energy at 1.7 feet per second would be very low, probably 60 foot-pounds or something like that.

Senator WARNER. Far less than the energy used in the test yesterday.

Dr. SCHULER. Far less.

Senator WARNER. Let me ask this question. Has the Navy been operating for many years, perhaps since World War II, under the theory that this particular powder would not ignite as a consequence of overpressure and that it required use of an igniter for detonation? That seems to me to be a very key question.

Dr. SCHWOEBEL. Yes, and I do not think we can really answer that. The Navy training, I think, is rather explicit in specifying the speed and distance of a proper ram operation, but I think that the interaction that Paul and Karl talk about and this mechanism that we are talking about is basically new ground.

Senator WARNER. It seems to me that the design of this propellant and the extensive period and number of times that it was operated safely lends support to the hypothesis that probably the Navy operated under the assumption that you could kick these bags around, that the ship could take a direct hit by a 16-inch round from another ship and still there would not be ignition; it would require some type of fusing and, therefore, they did not focus on whatever safety measures were necessary as a consequence of varying the number of pellets or putting a control mechanism for speed of the rammer. There was sufficient operating experience to justify those modes of operation and use of these powder bags.

It seems to me that that has to be revisited, Mr. Chairman.

Senator GLENN. Mr. Chairman, one other factor on this, if I might.

If I observed your test correctly, it was not in a constrained environment? It was not in a breech, or in a barrel, or something that perfectly constrained it. It was sort of a loose pile of these things and just held loosely together.

Would the energy and the temperature rise in the barrel or in the breech where the bags were rammed in? That kind of constraint does not let these things squish out at all, and temperature would go way up from what your test showed. It would be even worse in a gun barrel than it was in the test that blew yesterday. Is that correct?

It cannot squish out in a gun barrel. It is constrained, so with the rammer coming in, that transfer of energy is going to be far more direct even than it was in your test. So it would be a worst case situation in the gun barrel. Is that correct?

Mr. COOPER. The reactions here occur so quickly that if the bags break, they do not break and move out of the way until later in the chain of events.

Senator GLENN. I was thinking in terms of if whether you had high or low speed, you would have more of a temperature buildup in there for your 2 feet per second as opposed to 14 than you would with the bag over here. You would have a temperature rise period that would have more impact if you were inside the barrel. Is that correct?

Mr. COOPER. Once ignition starts, certainly the presence of the barrel would make it much, much worse. Now the bag diameter is only a little over 14 inches. The breech diameter of the gun is 18 inches. So there is a tremendous clearance in that system.

Senator GLENN. You have a squish effect inside the barrel, then, a little bit.

Mr. COOPER. That is one of the mechanisms where the gun absorbs energy and actually protects against this kind of impact.

The difference between the data that we did in small-scale tests and in the full-scale gun is the fact that in our tests we deliver all of the impact energy to the grains. So the data that Dr. Schwoebel showed represents the minimum energy for ignition.

Senator GLENN. Are there measurements made on how many trim layer grains are acceptable in these bags and how many are not? Has that ever been a factor in the past? Somebody said there is an average of 17 in the trim layer.

Mr. COOPER. So far, I think a part of the Navy's inventory has been sampled, and they found bags running between 17 and 61 grains in the tear layers. The entire inventory has not been sampled, so the statistics are——

Senator GLENN. How do they sample that? Do they just feel them or x-ray them?

Mr. COOPER. You can feel the grains in the bag.

Chairman NUNN. Let me ask this question: I am trying to get the significance of yesterday's test, because you had made your analysis before that test. I think we ought to make sure that we understand the charts we have all seen before here and the correlations and the probabilities were before yesterday's test. Yesterday's test tells us something, but it does not tell us nearly as much as we had already seen. Is that right?

Mr. COOPER. The previous testing that we had done, as I was explaining, represents the minimum energy to set off grains during impact. In a gun, you have a lot of mechanisms where you lose energy during ramming. The bags buckle slightly, the bags compress, pellets move around and bypass each other. All of these are mechanisms that absorb energy that is no longer available to those individual grains in the tear layer.

Senator GLENN. Dr. Schuler was going to add something a minute ago.

Mr. COOPER. So the importance of the testing that the Navy is doing now is to establish that difference of seeing how much energy really is lost in the gun and how much of that is now available for the mechanisms that we were looking at in the small fixtures.

Chairman NUNN. I guess what I would like to find out at this juncture, and then we will open it up, is what was the significance of yesterday's test? Again, what does it tell us and what does it not tell us?

Senator WARNER. What does it add to the base of technical data you developed at Sandia?

Mr. COOPER. It gave us two very important pieces of information. One, it is the first indication of how much energy is partitioned to the rest of the system as compared to that which can go into the tare grains, and that piece of information, once it is expanded with more tests, will help us extrapolate this point of data more accurately.

The second piece of information was that it established that within the possible operating envelopes of the gun that with a small number of tare layers and at the maximum ramming speed that is within the envelope of operation of the gun you could get an ignition during an overram. I am not saying that is a probable event——

Senator WARNER. The tests being conducted at Dahlgren are really on the threshold of their test cycle, is that not correct?

Mr. COOPER. Yes.

Senator WARNER. We are at the very preliminary stages of a really elongated test cycle, and they have not got to the point of actually making tests associated with an actual rammer and an actual gun barrel.

Mr. COOPER. That is correct.

Senator WARNER. That is why I think we have got to exercise caution not to leap to conclusions.

Mr. COOPER. Absolutely.

Chairman NUNN. Could you tell us what scenario comes out of both your previous studies and yesterday? What scenario could we pose, now, as a possible—not a probable—cause of the occurrence on the *Iowa*, the tragedy that took place there? What scenario could have occurred?

Dr. SCHWOEBEL. One that we have thought about, is a very simple one that seems consistent with at least several of the facts. During our review and a number of inspections, in conjunction with Navy personnel, we found that the powder hoist, the powder door, the rammer and other mechanisms in the gun room appeared to be in proper operating condition at the time of the explosion. That is, there was no malfunction that we could find in the system.

Now, as established by the Navy investigation, the door to the powder hoist was closed and locked, but the powder car had not been lowered at the time of the explosion. Immediate lowering of the car on closure of the door is the normal procedure. That is the upper powder hoist operator's function. This suggests to us that the ramming occurred soon after closing the powder door, and may have occurred at very high speed. The counter of this is as follows. Suppose that a very slow ram occurred, as postulated by the Navy. A slow ram of, say, 1 to 2 feet per second, followed by this extended period of 15 to perhaps 30 seconds of sustained overram while the igniter is activated. That means that the upper powder hoist operator would have had on the order of maybe 20 to 30 seconds to begin lowering this powder car. His job is to do that right away.

However, on the contrary, if a high-speed ram occurred, there would have been little opportunity for the operator to begin lowering the powder car. So it occurs to us that another way of thinking about this is a very simple way in which a high-speed overram occurs, and the explosion takes place so fast that the upper powder hoist operator has no opportunity to lower the car.

A factor that might contribute to an overram was an unidentified problem in the loading operation. This unidentified problem was reported through the ship's phone system by a member of the gun crew. It led to a delay in loading the center gun relative to both the left and right guns in turret II, and this undefined problem might have created confusion, for example, during the powder loading phase. So we conclude that a plausible cause of the explosion aboard the U.S.S. *Iowa*, was a higher than normal speed overram of the bag charges into the rear of the projectile, initiating one of the forward bag charges that contained a reduced number of pellets in the trim layer. The fact that the bags were moved to a position substantially beyond the normal position is evidence to us, is an indication to us, that it may have taken place at a higher than normal speed, so that in some sense it was not fully controlled.

This is a very simple view that seems to us to be consistent with the facts.

Chairman **Nunn**. Is it fair to say this is a possible scenario at this stage?

Dr. **Schwoebel**. We think it is a possible scenario.

Chairman **Nunn**. Would you say it would be fair to say it is a probable scenario?

Dr. **Schwoebel**. I do not think we can say that.

Chairman **Nunn**. You do not have enough evidence to say it is a probable scenario?

Dr. **Schwoebel**. That is exactly right.

Chairman **Nunn**. What else do we need to do now? What else do you believe needs to be done to complete the investigation that you have underway?

Dr. **Schwoebel**. What I would like to see happen is for technical teams from both Sandia and the Navy come together again to discuss all of these results and continue studies that explore this range of impact sensitivity and what the key factors are, and explore those in much more detail. We have only in some sense a beginning of this process, and that needs to go on.

Chairman **Nunn**. Is it fair to say, though, at this stage, that you know enough now on probabilities that you believe your recommendations should be taken seriously by the Navy in terms of changing and eliminating even the possibility of this recurring?

Dr. **Schwoebel**. We do.

Chairman **Nunn**. You believe the recommendations you have made, if carried out, would eliminate the possibility of this recurring in this type scenario?

Dr. **Schwoebel**. We think these are steps clearly in the right direction.

Senator **Warner**. Mr. Chairman, again I commend you and others for working to bring this hearing together. Having heard this evidence today, I have now formed an opinion, and I state it solely as a recommendation to the Secretary of the Navy, not a direction. It seems to me that the procedures followed thus far by the Chief of Naval Operations were to appoint a single officer to look into this situation, make findings, and report; and that has been done. Now, today we have received new evidence and the Secretary of the Navy has reopened the investigation.

It seems to me it would be prudent for the Secretary of the Navy to consider appointing a board of officers, and that board would do at least three things: number one, go back over all the evidence that provided the findings of the previous single officer; second, review this new evidence; and third, determine whether or not there should be further investigation either of a technical nature or involving witnesses; and then provide a complete set of findings based on this review of those three categories.

The Secretary of the Navy, so far as I know, has not signed off on the original single officer investigation, and it would be within his purview to now establish a new board composed of several officers to do at least these three steps.

Chairman **Nunn**. Senator Warner, I would not disagree with anything you have just said. I would add one other thing to it, which I think is very important, and that is to keep Sandia involved as an independent, and I think objective, analytical, technical capability.

Senator WARNER. Very clearly, and I accept that, Mr. Chairman.

Gentlemen, first I will ask you, Mr. Conahan, you have had a lot of experience in looking over situations where investigations have been conducted by elements of the Department of Defense, other Government agencies and so forth. Is that not correct?

Mr. CONAHAN. That is correct, yes, sir.

Senator WARNER. Have you found in the course of your investigation any evidence whatsoever to indicate the Navy at any time tried to perform a cover-up of this situation?

Mr. CONAHAN. No, I do not think that they attempted to do anything in the way of a cover-up. I do think, however, that a close evaluation of the way that they went about doing their investigation would come to a conclusion that perhaps too early on in the investigation they ruled out other possible or plausible causes for the explosion.

Senator WARNER. Dr. Schwoebel, in your work, did you find any facts or information, to indicate that the Navy at any time tried to cover up or interfere with your testing procedures?

Dr. SCHWOEBEL. Our interactions with the technical team have been open, and candid. They have helped us in every possible way.

Senator WARNER. Fully cooperative?

Dr. SCHWOEBEL. Fully cooperative.

Senator WARNER. And the Navy was fully cooperative with the GAO, I presume, during the course of its inquiry?

Mr. CONAHAN. Yes, sir.

Chairman NUNN. Senator Warner, I would add the Navy, at our request, helped pay for the experimentation that took place at Sandia.

Senator WARNER. Yesterday, Mr. Chairman, when I talked with the Secretary of the Navy, the Chief of Naval Operations, the Vice Chief, they were very forthcoming about all the facts and information, so I hope that those persons who want to characterize this situation would think twice about employing the word "cover up" which has been used frequently in the last 24 hours. I find no basis for it, you find no basis for it, and you have made an independent analysis.

Do you have any recommendations for further technical tests beyond those scheduled in the next 2 weeks at the direction of the Secretary of the Navy and the Chief of Naval Operations?

Dr. SCHWOEBEL. What we would recommend is really contained in number three of our recommendations, and that is for an ongoing study. I think that that is quite important and, that these questions may not be fully resolved in simply another 2 weeks of testing.

Senator WARNER. I will return to my second line of questions when the time comes, Mr. Chairman.

Chairman NUNN. I believe Senator Bingaman is next.

Senator BINGAMAN. Thank you, Mr. Chairman.

Let me again compliment those who worked on this. I think you have done an excellent and objective job.

Let me just recount my understanding of what occurred. We had testimony on November 16 in which Admiral Milligan testified as to his report and his investigation for the Navy and concluded—in answer to one of your questions, Mr. Chairman, he said, "Mr.

Chairman, I have to say we have excluded all other possibilities and have come to this as the only possible conclusion."

In his prepared testimony then, he said "My investigation eliminated accident and a malfunction as the cause." You are saying that there is a plausible scenario which would attribute this event to accident or malfunction? That is what I am understanding you to be saying here. Is that accurate?

Dr. SCHWOEBEL. Yes, that is correct.

Senator BINGAMAN. The other conclusion which I understand the Navy had was——

Chairman NUNN. Senator Bingaman, would you yield on that one point, and I will not take away from your time in any way, because I think that is very important. In the testimony before our committee on November 16, Rear Admiral Milligan, who headed the Navy investigation said, and I quote, "The technical points of this investigation clearly demonstrate that an accident did not cause the explosion."

Dr. Schwoebel, from what I understand of your testimony this morning, you disagree with that?

Dr. SCHWOEBEL. We think, as I have said, that there are some important phenomenon that were not understood at that time, and that there are other plausible explanations.

Chairman NUNN. According to Admiral Milligan, he also said, "No plausible accidental cause of ignition could be found." And in answer to Senator Bingaman's question you disagree with that.

Dr. SCHWOEBEL. We think that there is a plausible other way in which the explosion could be initiated.

Chairman NUNN. Thank you.

Senator BINGAMAN. Let me ask about a couple of other items that Admiral Milligan identified. He said that the report, and this is the Navy report, concluded that unique foreign material was present on the *Iowa* projectile. And from what I understand you to be saying, you have not found any such unique foreign material on the *Iowa* projectile, is that correct?

Dr. SCHWOEBEL. The unique material, from our perspective, is the iron fibers of the diameter that have been observed. That is the one constituent of the system that we cannot tie in a definitive way to some normal source. And there may be a rational explanation for that, but we do not have a connection there at this time.

Senator BINGAMAN. He went on to say here, and maybe this gets to the point you are making, he says the report concluded that foreign residue unique to the *Iowa* projectile could not be duplicated by simple contamination of the gun chamber with steel wool and other chemicals that might remotely be present in a gun firing. Now you disagree with that?

Dr. SCHWOEBEL. Yes.

Senator BINGAMAN. Everything you found there can be explained either by normal circumstances or by what he refers to here as simple contamination of the gun chamber with steel wool and other chemicals?

Dr. SCHWOEBEL. We cannot, as I have said, replicate or do we have an explanation for the presence of those 36 fibers that were found in the band of that size. We have not made that connection to some normal source.

Senator **Bingaman**. But you have not found those either? Those are the ones that are not present?

Dr. **Schwoebel**. No, those fibers are available. There are some of those which could not be located, but we have heard from the Navy people in the last few days that some of those crusted fibers have in fact been located.

Senator **Bingaman**. Well, let me ask this in maybe a little less technical jargon. My understanding is that the Navy concluded that something was present there which could not be explained other than by some intentional act of one of the personnel involved. And they concluded that there was some type of homemade explosive device which caused this occurrence.

Did you find any evidence to support the claim that there was a homemade explosive device that caused this?

Dr. **Schwoebel**. We have concluded that we can neither prove nor disprove the existence of a chemical igniter.

Senator **Bingaman**. So you found no evidence to prove it?

Dr. **Schwoebel**. That is correct.

Senator **Bingaman**. And you found no evidence to disprove it?

Dr. **Schwoebel**. That is correct.

Senator **Bingaman**. And then the obvious chain of logic that the Navy used was since there was not an accident, in their opinion, and there was not a malfunction, that this must have been—I think on page 61 of their report they said "the explosion in center gun turret II of the U.S.S. *Iowa* resulted from a wrongful, intentional act. And based on this investigative report, and after full review of all Naval Investigative Services reports to date, the wrongful, intentional act which caused this accident was most probably committed by Gunnersmate, Clayton Hartwig."

You are saying that you found no evidence to support the conclusion that there was an intentional act by Gunnersmate Hartwig or anybody else?

Dr. **Schwoebel**. Our investigation was, as I have said, circumscribed. We looked at the technical aspects of this. A full investigation, of course, would include many other factors that you are aware of.

Senator **Bingaman**. Right.

Senator **Warner**. You were not looking for evidence of the type suggested by the Senator from New Mexico, were you?

Dr. **Schwoebel**. As I said, we can neither prove nor disprove the existence of an igniter.

Senator **Bingaman**. I guess the point that I am just trying to nail down here, first of all, is that you have no evidence that you uncovered in your investigation to support the conclusion that this occurrence was the result of an intentional act?

Dr. **Schwoebel**. We have no evidence of that nature.

Senator **Bingaman**. And second, you do have, you believe, a plausible alternative explanation for the accident—or for the occurrence?

Dr. **Schwoebel**. We believe that this is a plausible explanation. To determine the extent of that plausibility depends very much on continued studies that would be done.

Senator **Bingaman**. Thank you very much. My time is up, Mr. Chairman.

Chairman NUNN. Senator Glenn.

Senator GLENN. Thank you, Mr. Chairman.

The thing that comes out of this that is very disturbing, of course, is that blame was placed on Hartwig because of an inability to find other reasons. That is wrong. Now we find there were other reasons because there were errors made in how far the rammer went in. The Navy, you say, now agrees with that. That it can be another reason for this. And the rush to blame Hartwig was flat wrong.

I hope we learned something out of this. I am not sure that we have yet. The rush to use a personality profile, as sketchy as that was, and come to the conclusions that Senator Bingaman just brought out, I have questioned ever since this thing started. So I hope whatever board or whatever we want to do to straighten out our processes in this thing, among other things, should be done and done immediately.

When I was talking about the squish effect a while ago, to get on another subject, Dr. Schuler, you were trying to get the microphone there and I cut off and somebody else got on with questioning. What was it you were about to say about that?

Dr. SCHULER. That videotape you saw, Senator, showed an assembly that was then placed into a cylinder, so there was confinement in our tests.

Senator GLENN. There was, but not like the confinement there would have been in a barrel. But from what Mr. Cooper said here, too, there is some flexibility effect in the gun barrel itself. So that would take away some of my concern there.

Did you look at what impact it could have had where there were five bags used instead of six? I would think that if there were six bags in a normal load that that gives you a little more flex effect in there. These are not solid bags, they are not steel, and they are not even as hard as wood or anything. They are quite flexible.

Would that have had an impact in—the fewer bags you use the more—the less flexibility factor is going to be in that whole length, if you follow what I am getting at.

Dr. SCHULER. Yes. I think with fewer bags you have less of an energy dissipation source. You have one more bag that could dissipate energy, that is true.

Senator GLENN. You would have less of a compression factor. So the temperature would go up even higher, the fewer bags, is that correct?

Dr. SCHULER. If you have less mass of bags, the total kinetic energy at the maximum rammer speed would be less. But the sixth bag might provide additional energy losses to compensate for the greater energy.

Senator GLENN. Mr. Chairman, is there going to be any discussion of what kind of investigation we think the Navy should go into on this? Senator Warner brought that up a moment ago and I do not know whether we are going to discuss that today, or is that going to be subject to further meetings and discussion?

Chairman NUNN. Well, I have talked to Secretary Garrett and I know Senator Warner has talked to him, and they assured me they have reopened the investigation and they are going to proceed with all due diligence to look at all of this new evidence and see where they go from here. And I personally feel strongly that Sandia should be kept in as an independent observer of this and participant in it. Beyond that, I guess we will have to wait and hear from the Navy on their plans.

Senator GLENN. The only other thing I would say, Mr. Chairman, is that I think the fact that the Navy has been firing these guns for a long time, and we had all of the World War II experience, if there is metal fatigue and a wing falls off my airplane, it only takes once and you are in bad, deep trouble. And that this finally came out as something that could happen, the fact that it did not happen over hundreds of thousands of firings through the years does not mean anything.

But what is most disturbing is that there was a willingness, because of lack of other information, to go ahead and blame this basically on a personality profile, and to assign blame and say it could not have been anything else, when your information here indicates that it could be, and you do not know for sure that this caused it, I am not saying that at all, but there are other things that could have caused that accident. And that is the most important thing that has come out of this. Now we have got to get on and make sure it does not happen again.

Thank you.

Chairman NUNN. Thank you, Senator Glenn. Senator Levin.

Senator LEVIN. Thank you, Mr. Chairman.

I would like to focus on the foreign materials question for a minute, because it seems to me that what the testimony this morning highlights is, number one, that there is an innocent alternative explanation for what happened which the Navy did not consider. But it also highlights that the Navy's explanation that there were unique foreign materials—and that was the basis of their report—is not accurate.

I want to just go through that a bit with you. I want to start with Admiral Milligan's testimony before us. When I was questioning him last time about foreign materials—it was not last time, it was one of the times he appeared in front of us—he said: I am satisfied that foreign material was in the band. My report is based on foreign materials, sir.

His report is based on the presence of foreign materials that are unique. And again, in response to my question, he said: My report is based on the fact that there was foreign material, something foreign to the normal propellant charge in the center gun of turret II on April 19. That is the issue, he said.

And then when you read his written statement of November 16, 1989, he said that this report concluded unique foreign material was present on the *Iowa* projectile. The report identified the material as iron wires coated with calcium, chlorine and oxygen. He stated that these materials were not found on projectiles used as test or control shoots.

The report concluded: This foreign residue, unique to the *Iowa* projectile, could not be duplicated by simple contamination of the gun chamber with steel wool and other chemicals that might remotely be present in a gun firing.

You are telling us, as I understand it today, that these other chemicals are indeed commonly present, putting aside the steel wires for a moment?

Dr. SCHWOEBEL. The other chemicals are common to that environment.

Senator LEVIN. So there is a very sharp disagreement on this point, that the other chemicals that were present there were not unique. In other words, these were common chemicals commonly found either in a turret or on a ship; correct?

Dr. SCHWOEBEL. That is correct.

Senator LEVIN. So that is a big part of the Navy's findings right there, and I am going to read it again. "The report concluded this foreign residue unique to the *Iowa* projectile," the Admiral said, "could not be duplicated by simple contamination of the gun chamber with steel wool and other chemicals that might remotely be present in a gun firing." We have taken care of the other chemicals. They are present in gun firings and on turrets.

Now that gets us to the other element that he found to be unique, which are those wires that he calls steel wool, by the way. Are they steel wool?

Dr. SCHWOEBEL. They are iron fibers with a low carbon concentration, and steel wool is commonly made of a low carbon iron.

Senator LEVIN. Is there any other substance of which those fibers are part besides steel wool?

Dr. SCHWOEBEL. Not that we are aware.

Senator LEVIN. Would you then agree that those are steel wool fibers, or is that also not necessarily an accurate conclusion?

Dr. SCHWOEBEL. I will let our materials expert, Dr. Borders, talk about that.

Dr. BORDERS. The fibers that we identified were iron, as Dick has said, with low carbon and low alloying species. We cannot distinguish those from other sources of iron with low carbon and low alloying species such as might be found, for example, from shavings of the blind loaded and plugged projectile that was used in the center gun at turret II on that day. That is not to say that that was necessarily the source of them.

There are other possibilities probably too numerous to mention that are further down on the probability scale, but steel wool is certainly a very ubiquitous substance that is found in many areas and, although not specifically authorized for use in the gun rooms, we were told that it was used in the gun room of center gun turret II after the U.S.S. *Iowa* explosion for certain cleanup procedures.

Senator LEVIN. Would that explain their presence in the band?

Dr. BORDERS. That is not clear.

Senator LEVIN. Could they have gotten into the band as part of the cleanup?

Dr. BORDERS. There is a slight possibility.

Senator LEVIN. Is there any other innocent explanation of how they could be in that turret?

Dr. BORDERS. We cannot think of one. That is not to say we can think of everything.

Senator LEVIN. If steel wool had been used to clean up that gun at some earlier point, could they have remained in that gun after that gun was fired? Would there be residue left in the band possibly?

Dr. **BORDERS**. It is our understanding that steel wool is not used to clean up in the barrels in normal operating procedures, but with the lubricants that were used, probably not.

Senator **LEVIN**. Finally, what you are saying is this could be steel wool but it is not necessarily steel wool; is that correct?

Dr. **BORDERS**. That is correct.

Senator **LEVIN**. That differs from the Navy's testimony that it was steel wool.

Thank you, Mr. Chairman.

Chairman **NUNN**. Thank you, Senator Levin.

I have asked a lot of questions, so I will defer to Senators Bingaman and Glenn for other questions. Then I have some wrap-up questions and a few observations.

Senator **BINGAMAN**. I have no questions, Mr. Chairman.

Chairman **NUNN**. Senator Glenn.

Senator **GLENN**. I believe I have no other questions.

I would just make a statement, though. I think the big mistake in this whole thing from the beginning is in saying that since we have found no other possible reasons, it must have been Hartwig. Now we know there may be other possible reasons, so the original rush to judgment, as I see it, was very premature.

Let me ask one other question. Let us say that the original theory that foreign materials were in there, that there was some sort of detonator or ignition device that was secreted in there in some way, do you feel that that could have been determined from the chemical analysis that was done after the accident? Could you have picked up a detonator presence?

Dr. **SCHWOEBEL**. We concluded that we could neither prove nor disprove the existence of an initiator, and that is based on the fact, of course, that there are a number of these materials which are commonly there. If there was one present, we would expect to find calcium, chlorine, et cetera. If there was no detonator there, we expect to find calcium, chlorine, et cetera, because of the fact that these materials are present.

Senator **GLENN**. Did you have full cooperation in getting those samples?

Dr. **SCHWOEBEL**. Absolutely. No problems whatsoever. As I have tried to impress on the committee, I think that the interactions that we have had with the Navy technical team have been outstanding.

Senator **GLENN**. I probably am reading things into this that I should not, but on page 5 of your testimony, "A major constraint to Sandia's analysis was that after the Navy and FBI's analysis there was no longer any part of the *Iowa*'s rotating band that had not been subjected to analysis or examination. Furthermore", as we talked about earlier, "the Navy could no longer locate a significant piece of evidence, the iron fibers with encrusted materials the Navy said came from a detonating device."

Then the last sentence. "However, Sandia was able to build upon the Navy's analysis and to obtain parts of the band to examine." That led me to wonder whether you had to get those through some surreptitious means. Did the Navy give you those? When you say that you were able to obtain parts of the band to examine, that indicated to me you got them from some other source than a normal request through channels. Is that correct?

Dr. SCHWOEBEL. Not at all. These samples were provided by the Navy.

Senator GLENN. All right, fine. Thank you.

Chairman NUNN. Thank you, Senator Glenn.

Mr. Conahan, I want to ask you two or three questions, and then I will have a couple more for our Sandia witnesses.

Much of the work that GAO did was connected with issues raised by the testimony of Captain Moosally, former commanding officer of the U.S.S. *Iowa*. Based on your testimony, as I understand it, it appears that much of what Captain Moosally had to say was borne out in your investigation; that is, about the training and about the overall priority of the battleship within the Navy. Is that generally correct?

Mr. CONAHAN. Yes, we found that as a general condition.

Chairman NUNN. Would you agree that problems you have identified relating to the adequacy of manning, the quality of personnel and training may have contributed to the accident? Is that a possibility?

Mr. CONAHAN. I think certainly there was an environment aboard the ship which would be consistent with some unfortunate occurrence somewhere along the way. Certainly the manning on battleships is considerably lower in terms of experience and, therefore, quality than it is on other ships. I think that the violations of safety procedures that we noted together with such things as unauthorized experimentation were taking place on the ship.

Chairman NUNN. You noted that the IG of the Navy concluded that experimentation had not posed a safety hazard to the U.S.S. *Iowa*'s crew. Based upon the results you have heard here this morning on Sandia's efforts; you agree with the Navy Inspector General's conclusion on that?

Mr. CONAHAN. I think that we need to do the further testing that has been talked about here this morning before that conclusion can stand up. I think that that conclusion is in some jeopardy at the moment.

Chairman NUNN. The IG's conclusion?

Mr. CONAHAN. Correct.

Chairman NUNN. With reference to issues like adequacy of manning, the quality of personnel and training, do you believe that the Navy investigating officer should have inquired into these issues?

Mr. CONAHAN. I think the Navy investigating officer should at least have brought them to the attention of higher authority. They should have been pursued whether as part of this investigation or not. I would not make a judgment on that, but I certainly think they were sufficiently serious that they should be pursued so that corrective action could somehow be recommended and taken.

Chairman NUNN. Your testimony indicated that 16-inch ammunition components do not fully meet the Navy's criteria for insensitivity since it demonstrates some susceptibilities to sympathetic detonation. Was that brought up in the Navy's JAG manual investigation?

Mr. **CONAHAN**. No, sir, it was not. We determined that as part of our own investigation.

Chairman **NUNN**. Does that have any possible relevance to the unfortunate accident on April 19, 1989?

Mr. **CONAHAN**. I have no independent judgment on that, but according to the Navy that condition is permitted to continue because they feel that they have greater problems aboard other ships with respect to ammunition, and budgetary resources need to be applied to the higher order problems. They rank their problems with respect to ammunition, and the problem that you speak of ranks 19 out of 25 such problems.

Chairman **NUNN**. You noted that two reviews scheduled to address the U.S.S. *Iowa*'s 16-inch training program did not do so, and you found significant weaknesses with the Navy's formal training program for the 16-inch gun operation and maintenance. Is that right?

Mr. **CONAHAN**. That is correct.

Chairman **NUNN**. Based upon your experience in conducting numerous investigations in the past, do you believe that such weaknesses are expected deviations from the norm, or would you classify them as significant abnormalities amounting to what I would call systemic problems?

Mr. **CONAHAN**. I think you could find similar weaknesses in other training programs. At the same time, in the gunnery field, you will find that they have better training programs for the more advanced weapons. One of the problems here is that they do not have hands-on training in the training programs for the people who are assigned. That is a difficulty.

And the people that we talked with on shipboard felt that, for the most part, whatever training they got was on-the-job training aboard the ship. However, if you take a standard that should be present with respect to training, they were way shy of it in this case.

Chairman **NUNN**. Have any of these problems, like training, been corrected since the *Iowa* explosion?

Mr. **CONAHAN**. Not in point of fact as of 2 weeks ago. I do not have anything in the last 2 weeks, but they did prepare a plan to correct some of these problems. But as far as I can tell, as of 2 weeks ago, they had not.

Chairman **NUNN**. Let me go back over a couple of points, Dr. Schwoebel, with you and your team.

As I understand your testimony, your team was able to ascertain that the overram was actually 24 inches rather than the 21 inches that the Navy had determined. And you were able to achieve ignition with a high speed overram, whereas the Navy's test at the highest possible rammer speed did not produce any reaction, until the one that we had yesterday.

First of all, can you tell us if the extent of the overram had any effect on the probability of ignition? I believe you alluded to that, but I want to make it clear.

Dr. **SCHULER**. I think the extent of the overram clearly shows that there was compression of the powder bag train. I do not know what it contributes to the probability of ignition other than you need an overram to get any kind of probability of ignition.

Chairman NUNN. Could you tell us why the Navy's test at the highest possible rammer speed did not produce any reaction, when your test did?

Dr. SCHULER. I can only speculate, and I would have to wonder about how many grains there were in the tare layers.

Dr. SCHWOEBEL. And, also, there may be a certain probability associated with this process, and you simply have to do enough testing until you fully fill out that understanding of what those probabilities are.

Chairman NUNN. So it could be one in 100?

Dr. SCHWOEBEL. That is entirely possible. And that of course is part of the reason why it is so important to extend these tests to understand what the connection is and what in fact are the real probabilities in the gun environment.

Chairman NUNN. I understand that your tests and analyses were limited to the D-846 bag powder charge, is that right?

Dr. SCHWOEBEL. Yes.

Chairman NUNN. Is there reason to believe that your findings would or would not have potential application to other powder bags? The Navy has several different powder bags, is that right, and the D-846 is only one of them?

Dr. SCHWOEBEL. Yes, the other one that is commonly used is the D-839. That uses a somewhat larger pellet. We do not know for sure what the configuration of that bag is, but we presume that it, too, may possibly have the trim layer in it. If it does, then it is subject to the same principles that we have discussed in the case of the D-846.

Chairman NUNN. Senator Warner, do you have any other questions or observations?

Senator WARNER. Mr. Chairman, just to follow up on one of your important questions. In looking over the training manuals, Mr. Conahan, was there any warning to operators against the consequences that could occur from overramming?

Mr. CONAHAN. We do not have an answer for that question right now. I would provide it for the record.

[The information follows:]

The basic manual for the 16-inch gun turret contains a warning that the powder should be rammed so that it clears the tip of the cradle tray by about approximately 3 inches. The gunnery handbook states that overramming can cause firing inaccuracies. We noted no other cautions or warnings concerning the overramming of the powder.

Senator WARNER. Dr. Schwoebel, in your analysis of training manuals, did you see any cautionary note to operators against the consequences of an overpressure?

Dr. SCHWOEBEL. We did not review the training manuals.

Senator WARNER. Any of the manuals? It concerns me that the guns have been in operation for so long, it seems to me the experience is such that it would have been incorporated into these manuals. And I find that to be an important question in this Senator's mind, in any event.

Gentlemen, I thank you very much. I join with the chairman in stating that you have made a very valuable contribution to this tragic mystery. I do not know that further tests can confirm the probability—and that is a key word that underlines all of this testimony in my judgment, probability—that this unusual set of circumstances could have contributed to an accident, which in fact might have been the cause for this tragedy.

So much work remains to be done before I think we can weigh that probability. Would you agree with that, Dr. Schwoebel?

Dr. SCHWOEBEL. I certainly would agree.

Senator WARNER. And, Mr. Conahan?

Mr. CONAHAN. Yes, I agree, too.

Chairman NUNN. I have a few concluding observations, but Senator Levin or Senator Bingaman, I do not want to cut this off until you have finished.

Senator LEVIN. I just have one, Mr. Chairman, if I might, or really two.

One, it seems to me that the Navy's conclusion has been seriously undermined in two fundamental ways. One is that there is an innocent explanation, one that they said did not exist. And two is that their own explanation of a purposeful, intentional act has been undermined because their conclusion was based, in their own words, on the presence of foreign materials that could not be explained in any normal, natural way in that gun turret. And today we hear that indeed the chemicals, at least, are very common to the gun turret.

Now before the committee would recommend to the Navy as to what step they should take next, I am wondering whether or not the chairman intends to ask the Navy to comment on this information. Because I would hope it would be at least possible that the Navy might take some steps to acknowledge the difficulties with their own conclusions, even prior to the conclusion of another investigation on their part.

In other words, I am just wondering whether or not we really want to suggest to the Navy what their next step should be before we hear from the Navy in one way or another. And obviously the chairman will make that decision. But I would ask the Chair if we should not at least hear from the Navy before making a recommendation to them on what their next step should be.

Chairman NUNN. Senator Levin, I talked to Secretary Garrett late yesterday afternoon, and I know Senator Warner has talked to him, and I said that we would afford them an opportunity to be heard this morning. I did not ask that he come as such. I said if they wanted to be heard they could be heard. And he suggested to me that he felt that they needed a couple more weeks of work and testing, based on what they know now, and that they would much prefer to be heard at that time.

And so I certainly thought that was a reasonable position. And they are free of course to make any statement they would like to before then, before this committee or otherwise, but right now that is where we stand.

Senator LEVIN. Well, before the committee makes a recommendation to them on a three-office panel or anything else——

Chairman NUNN. Well, I do not think we have made that recommendation. That was Senator Warner's observation.

Senator LEVIN. I understand.

Chairman NUNN. And I am sure, as a former Secretary of the Navy, he carries tremendous weight with the Navy. But I am not sure exactly how they plan to proceed. I have not made a specific suggestion to them. I just think they ought to conduct a thorough investigation based on these new findings of Sandia and the rebuttal of some of the old findings they made.

Senator LEVIN. Thanks.

Chairman NUNN. Senator Bingaman.

Senator BINGAMAN. Nothing.

Chairman NUNN. I want to thank all of our witnesses this morning; and I want to thank the numerous personnel of both the General Accounting Office and Sandia who contributed to this effort.

At the outset of this hearing, I stated that I anticipated that the testimony we would receive this morning would expose significant shortcomings in the Navy's investigation and would cast grave doubt on the conclusions the Navy drew as a result of their investigation. I believe that the testimony we have heard this morning has done that. Moreover, this morning's testimony identified a plausible explanation for the explosion.

I note with approval that the Secretary of the Navy has now directed that the firing of the 16-inch guns be suspended indefinitely and that the Navy's investigation be reopened. I also urge him to ensure that the reopened investigation considers all the matters brought out here today or any other matters that have come to the attention of the Navy.

I would like to summarize some of my thinking on this matter, based not only on the hearing this morning, but all the hearings the committee has had thus far. I want to emphasize very strongly that these are my first personal views, they are not committee views and should not be categorized as such. And they certainly do not necessarily reflect the views of any other member of the committee.

First, in terms of personnel. There are significant problems relating to the assignment of key officer and enlisted personnel to the battleships, in terms of adequate numbers, quality and experience. These problems are exacerbated by a lack of advancement opportunity for battleship personnel.

Second, in terms of training. There are significant training problems relating to the 16-inch guns. This is demonstrated by the inadequate oversight inspections, the lack of a training plan for the battleship class, and the significant weaknesses in the Navy's formal training program.

Third, as to the cause of the explosion. The Navy's conclusion that the explosion was the result of a wrongful, intentional act is not supported by reliable, probative and substantial evidence. Sandia's alternative scenario of a high-speed overram of a powder bag with a reduced number of pellets in its trim layer is a plausible explanation, although more testing needs to be done in this area. And certainly we cannot draw any definitive conclusions as to the likelihood of that scenario this morning. We will have to get further information.

I think the Navy should continue to conduct serious exploration of the Sandia alternative with the active participation of Sandia experts, plus any other alternative that may come to the mind of the experts.

I also want to make one comment about the process that was involved here. I think the Navy's investigative effort itself was flawed. The Navy chose to use an informal, one-officer format, rather than the type of administrative hearing that is often used to investigate tragedies of this magnitude when individual responsibility may be at issue.

If a hearing procedure has been used, the Navy would have designated persons with a direct interest in the matter as parties, who would have had the right to representation by counsel, and a formal opportunity to present evidence, cross-examine witnesses, and ensure that the proceedings were conducted in a manner structured to seek the truth. There were many people I think that could have been named as parties and given that opportunity.

Adversarial relationships in this kind of investigation always take longer, but in the long run, they may take a shorter time, and certainly there is a real search for truth that is possible in an adversarial relationship with other people being represented with cross-examination and so forth, that was not present here.

I think the Navy, in light of this, should conduct a thorough review of its guidelines for investigations to (1) clarify when formal hearings should be required, certainly that does not mean they have to be done in every instance; and (2) also establish a clear standard of proof, particularly when an individual who is deceased has been pointed to as the likely perpetrator of a terrible tragedy of this nature; (3) provide representation for persons who are unable to represent their interests or reputation due to death or disability.

So I think the Navy needs to look at the process as well as the substance.

Any other comments?

[No response.]

I thank all the witnesses for being here.

Senator Bingaman has been bragging on your laboratory out there a long time, and we know now that he has been telling us a great deal of truth here. We appreciate your being here.

[Whereupon, at 11:33 a.m., the hearing was adjourned.]

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